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Bruhat Bengaluru Mahanagara Palike

DETAILED PROJECT REPORT

CONSULTING SERVICES FOR PREPARATION OF
DETAILED PROJECT REPORT FOR

Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura

COST OF THE PROJECT: 200.00 LAKHS

Submitted To:

The EXECUTIVE ENGINEER,
Road Infrastructure,
Yelahanka,
BBMP, Bangalore.

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Chapter -1

INTRODUCTION

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Chapter -1
INTRODUCTION

1.1.1 Bengaluru is the capital of India's southern Karnataka state. The center of India's high-tech industry, the city is also known for its parks. It is also known as the Garden City because of its many beautiful gardens and parks. By Cubbon Park, Vidhana Soudha is a Neo-Dravidian legislative building. Former royal residences include 19th-century Bangalore Palace, modeled after England's Windsor Castle, and Tipu Sultan's Summer Palace, an 18th-century teak structure.During the last couple of decades, city has witnessed drastic increase in population, change in land use pattern of the city, life style of the people and their commuting habits and the revolutionary changes that has taken place in the automobile industry. This has contributed to the growth of vehicular traffic in an enormous way.

1.1.2 It also called the Silicon Valley of India , because of the high concentration of IT industry. Bangalore is rated to one of the fastest growing cities in Asia with a current population of more than 10 million. During the last couple of decades, city has witnessed drastic increase in population, change in land use pattern of the city, life style of the people and their commuting habits and the revolutionary changes that has taken place in the automobile industry.

1.1.3 The Bangalore city population is currently more than 11 million and increasing in a forward march. The lifestyle of the citizens is changing day to day due to globalization and introducing of new brands in all sector. Bangalore, the fastest growing city of India, comprises of a dynamic blend of people, belonging to various religions, castes and communities. With the introduction of information technology in the city, it has assumed an international character. IT professionals not only from the various parts of India, but also that of the world, are migrating to the city. This has led to Bangalore becoming more like the melting pot of various cultures. Read on to know more about the people and lifestyle of Bengalooru, India. What adds to the traffic pressure in Bengaluru in particular is that there is very little scope for expansion of roads and the need to use existing roads for smooth movement of vehicles is even more pronounced. It thus becomes mandatory for the administration to ensure better parking facilities. So far, the government and the BBMP have not taken this issue seriously and now the situation is such that it needs to be addressed seriously and effectively. Rapid population growth because of IT and other associated industries in Bengaluru led to an increase in the vehicular population to about 1.5 million, with an annual growth rate of 7-10%. With the increase in population and the expansion of the city, the problem of connectivity of the populace has arisen. Quite obviously personalized modes of transport have grown at a tremendous rate and two wheelers along with the cars

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almost comprise 90% of the total registered vehicular population in the city. Two wheelers constitute more than 70% of the total volume, while cars comprise 15%, autos 4% and the remaining 8% includes other vehicles such as buses, vans and tempos.

1.1.4 The combined effect of all these on the road network of Bangalore is delay and congestion beyond tolerable limits. Vehicular conflicts at the intersections are being eliminated by traffic signals but at the expense of delays and long queues. The peak hour has spread over a longer period of time, since there are no perceptible capacity augmentation / conflict reduction measures.

1.1.5 As a comprehensive development programme for improvement of road network, the Bruhath Bangalore Mahanagara Palike (BBMP) has planned Improvements to Junction, widening / Improvements of roads, strengthening of pavement base and sub - base, improvement to pedestrian facilities, improvements to Drainage Facility, etc. This response is the answer to the severe strain on the urban infrastructure, which is inevitable due to the very rapid rate of growth in traffic. Travel demands of passengers have increased many folds in the last two decades. Unfortunately growth in the infrastructure is not commensurate with the growing demands of traffic. There is an exigent need to effectively manage the traffic and transportation systems to optimize the solutions with short term afid long - term measures.

1.2 Project Location

The Project includes Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura. The Project area is falls under Yelahanka Division, Byatarayanapura Assembly Constituency in Bangalore City. The Project area is located thickly populated Residential cum Commercial area. The Project Stretch includes Arterial roads and Sub-Arterial roads. For the habitation resided in this area it was very difficult to commute on this stretch in the Rainy season due to non proper flow of water on the Roads and lack of proper drainage facility. By considering these reasons the roads are taken up for Development with Asphalting or White topping depending upon the site scenario.

Key Map of the roads proposed is enclosed in **Annexure A.1.1.**

M/s. NEWZEN CONSULTANTS BANGALORE is entrusted by BBMP to carry out the work of Preparation of Detailed Estimate and Report for the above said work.

Accordingly we **M/s. NEWZEN CONSULTANTS BANGALORE** have commenced the consultancy works as per the scope of services described in the RFP document.

1.3 Scope of Work

The Scope of Services of the Consultancy includes the following:

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- Inventory and condition surveys for existing road & pavement, cross drainage structures and bridges.
    - Engineering surveys and investigations
    - Improvement to the existing pavement and drains, such as horizontal and vertical alignment, curve straightening, rising of the road level in low lying areas above the HFLs, concentric widening / eccentric widening etc.
    - Design of Pavement.
    - Overlay Design.
    - Design of lateral side drains and Cross drainage works such as culverts etc
    - Rate analysis of scheduled items, BOQ and Cost estimates.
    - Final Detailed Project Report and final drawings
    - Photos of the project roads or site

1.4 Contents of the Report

The Methodology, as detailed in the Project proposal, it has been followed for carrying out the necessary Investigations and for the Preparation of Detailed Estimate and Report.

This Report includes the following.

- Chapter 2: Investigation & Surveys
- Chapter 3: Design Standard & Specification
- Chapter 4: Design & Proposals
- Chapter 5: Project Cost Estimates
- Chapter 6: Executive Summary

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Annexure A. 1.1

KEY MAP

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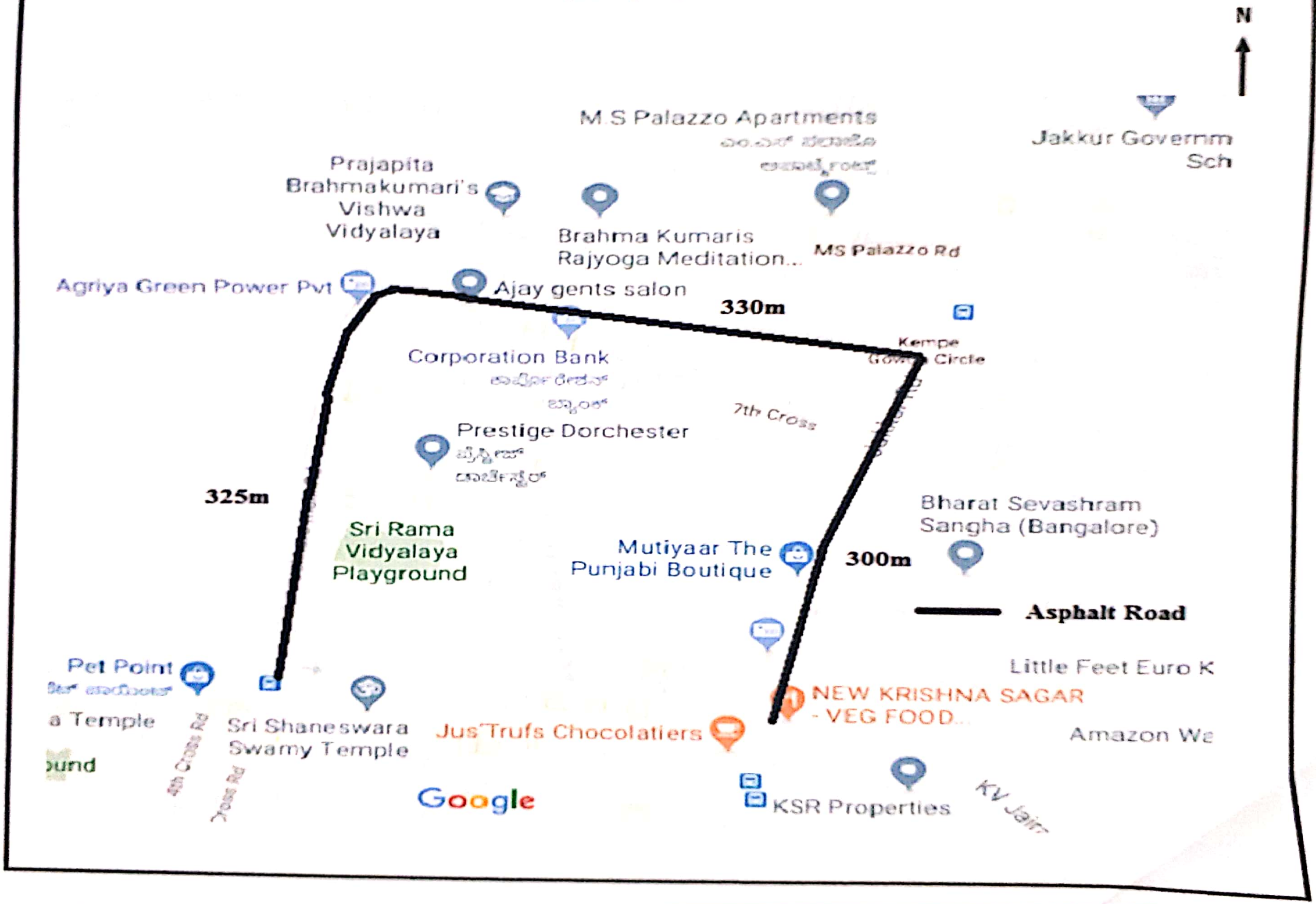
Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura



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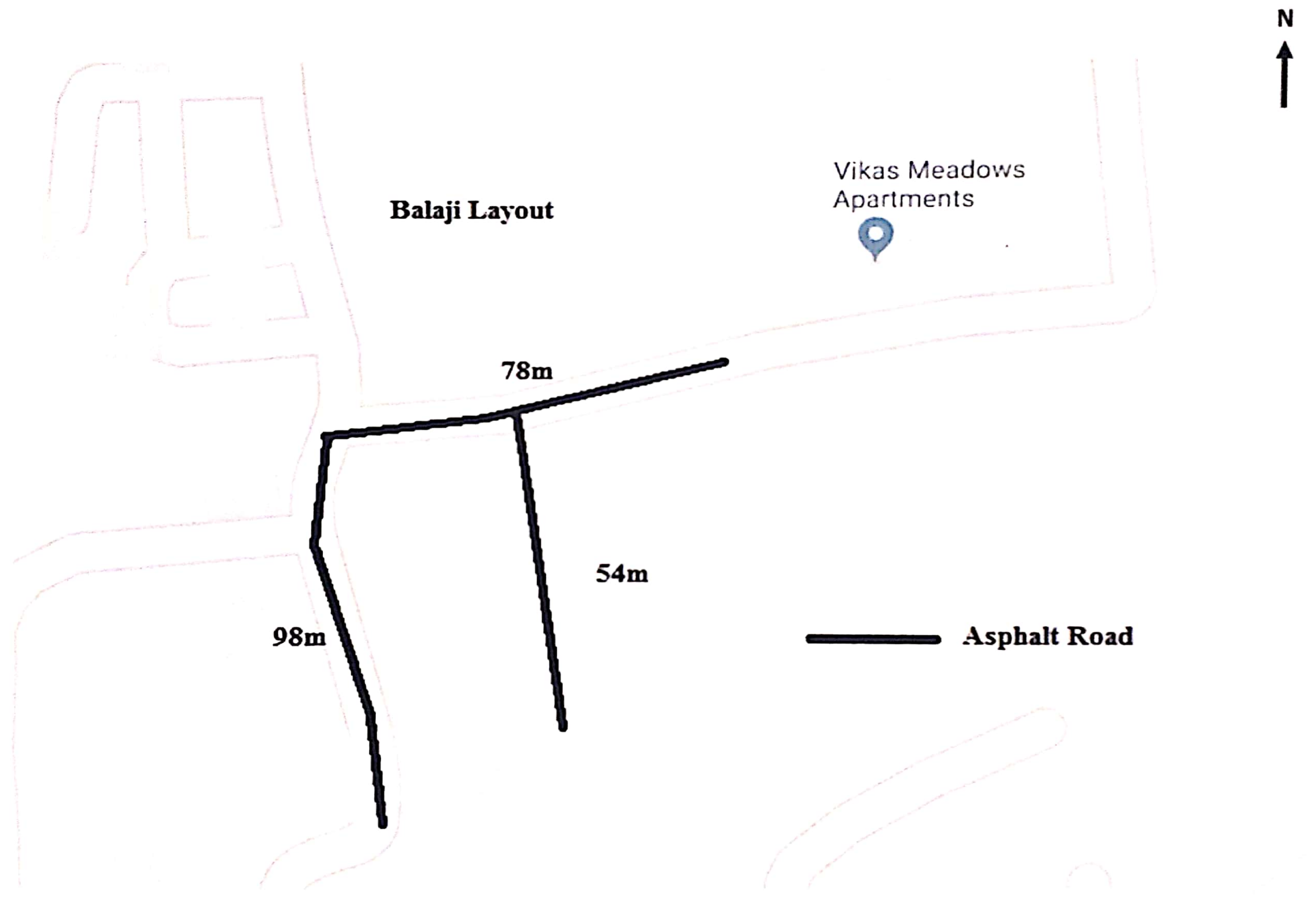

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Chapter -2

INVESTIGATION & SURVEYS

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Chapter -2
ENGINEERING SURVEYS AND INVESTIGATIONS

2.1 General

Various surveys and investigations that are the essential inputs for detailed engineering design are detailed in this chapter. All the relevant maps / data / details available with the concerned departments have been collected, compiled and reviewed. Particular attention has been given to past / historical data / reports. A review of the past data available in the various studies has been listed out and such available data has been made use of, after updating / augmenting the data wherever necessary. The data as collected has been made use of in analysis, design, formulation of improvement proposals and costing. The activities have been performed on several fronts fully complying with the requirements. The activities that are carried out are brought out hereunder.

The various engineering surveys / investigations of the road sections include:

- Reconnaissance Survey.
- Visual Topographical Survey.
- Road Inventory Survey.
- Pavement Condition Survey.
- Visual Condition Survey.
- Structure Condition Survey
- Soil, geo-technical, material, hydrology and drainage surveys

2.2 Reconnaissance Survey

Reconnaissance Survey of the road, considered for improvements, has been carried out to identify the general condition of roads, drains, culverts and bridges for further surveys / investigations, to understand kind of establishments along the stretches of roads and to work out land acquisition scheme. Making use of the observations / data collected during reconnaissance survey, detailed schedule for surveys / investigations required for the project has been finalized.

2.3 Visual Topographical Survey

Topographic Survey has been conducted all along the corridor by physically measuring the Road Width, Footpath Width, Drain Width, Alignment of Road and with the aid of Google Maps.

2.4 Road Inventory Survey

A detailed inventory and condition survey of road sections has been carried out by making use of well structured inventory data format. It was compiled in tabular form, developed using Excel computer software. Various data collected during the road inventory broadly include.

- Type of terrain.
- Land use.
- Carriageway width.

- ❖ Type of surfacing.
- ❖ Shoulder, Median, Drain (tertiary / shoulder), Footpath - type and width.
- ❖ Road Geometry.
- ❖ Road Furniture.
- ❖ Salient Buildings & Structures.
- ❖ Road Intersection(s) and their details.
- ❖ Land width (RoW).
- ❖ Culverts, bridges and other structures (type, size, span arrangement and location).
- ❖ General drainage conditions.

2.5 Pavement Condition Survey

The Pavement Condition Survey has been carried out in accordance with IRC Guidelines. All surveys and investigations have been carried out with the following objectives:

- ❖ To have an up to date record of road assets.
- ❖ To have a clear understanding of road side features including land use, drainage characteristics, etc. and
- ❖ To assess the condition and strength data for developing improvement proposals and related designs.

2.5.1 Visual Condition Survey

Visual Condition Survey of the road sections has been carried out by travelling along the patching, rutting, pot holes, edge breaking, etc. by visual observations in a well structured data format. The data so collected has been compiled and presented (kilometer wise) in the form of tables for easy understanding. This data has been used to assess the pavement condition.

2.5.2 Soil, geotechnical, material, hydrology and drainage surveys

(i) The activities and Deliverables forming part of the soil, geotechnical, material, hydrology and drainage surveys are described below:

(a) The characteristics of the existing soil of the Project road.

(b) The determination of sub grade CBR (soaked) Project road.

(c) Benkelman Beam Deflection measurements on the Project road for overlay stretches.

(d) Preliminary hydraulic data for bridges, design discharge, HFL, LWL, etc. with a view to checking adequacy of existing waterway.

(e) A broad assessment of the drainage condition and requirement of the Project Highway.

(ii) Road signs, safety devices

(a) The provision of Road Signs, Pavement Markings, Safety Barriers, Railings, Delineators, Chevron Markings, Traffic Attenuators. It shall also include Crash Barriers for existing bridges.

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Chapter -3
DESIGN STANDARD & SPECIFICATION

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Chapter -3
DESIGN STANDARD & SPECIFICATION

.1 General

Planning and design of roads & CD structures, pedestrian facilities and street furniture are essentially based on the IRC standards and MoRT&H specifications. Whenever, the codes / standards are silent on some of the aspects, the same has been planned / designed based on sound engineering practices. Design standards relevant to the project road along with the broad list of design parameters and the relevant IRC codes / specifications have been detailed in **Table 3.1.**

Table 3.1: Design Standards

SL No.	Design Parameters	Reference Code
1.	Geometric Design Standards • Carriageway width • Shoulder • Footpath • Median • Camber • Super Elevation • Horizontal Alignment • Vertical Alignment	As per IRC: 38 - 1988, IRC: 86 - 1983 & IRC: SP : 23 – 1993
2.	Road Furniture • Road Delineators • Road Markings • Road Signs	 As per IRC: 79 – 1981 As per IRC: 35 – 1997 As per IRC: 67 – 2001
3.	Road Capacity	As per IRC: 106 – 1990
4.	Pavement Design	As per IRC: 37 – 2012 & IRC: 58 – 2011
5.	Overlay Design	As per IRC: 81 – 1997
6.	Road Drainage	As per IRC: SP: 42 - 1994 & IRC: SP: 50 - 1999
7.	Culverts	As per relevant IRC codes and MoRT&H

The project road section passes through plain terrain. Design standards (as appropriate) have been further elaborated under the following heads:

- ❖ Geometric Design
- ❖ Pavement Design
- ❖ Overlay Design
- ❖ Drainage
- ❖ Road Furniture and Appurtenances
- ❖ Bridges and CD Structures

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3.2 Design Standards Related to Geometric Design

Design standards related to road geometric along with the suggested design values / standards and recommended values based on site conditions and data analysis are detailed in Table 3.2.

Table 3.2: Geometric Design Standards

SL No.	Design Parameters	Design Values
1.	Design Speed	Design speed Considered is 40 kmph.
2.	Geometric Design Standards	
	• Carriageway Width	Two lane/ Four lane carriageway
	• Camber (Bi-directional)	2.5% for paved carriageway.
	• Super Elevation	Limited to 4%.
	• Footpath	Minimum width - 1.5m
	• Kerb	Barrier / Semi — barrier / Mountable (Barrier type recommended)
	• Extra Widening at Curves	Nil for Radius above 300 m
	• Gradient	Maximum Gradient - 4.0 % (1 in 25) Minimum Gradient for Drainage - 0.5 % (desirable minimum) & 0.3 % (absolute minimum).

3.3 Design Standards Related to Pavement Design

Design standards related to Pavement design are essentially based on the guidelines given in IRC: 37 - 2012 "Tentative Guidelines for the Design of Flexible Pavements ". The suggested design values / standards and recommended values based on site conditions and data analysis are detailed in Table 3.3 and are adapted in the design.

Table 3.3: Overlay Design Standards

SL No.	Design Parameters	Reference Code / Design Values
1.	Pavement design	IRC: 37 - 2012 " Tentative Guidelines for the Design of Flexible Pavements "
	Initial Traffic	In terms of CVPD, vehicles weighing more than 3 ton
	Traffic growth rate	5%
	Design Life	10 to 15 years
	Vehicle damage factor	1.5 to 4.5
2.	Soil Characteristics	CBR Value

3.4 Design Standards Related to Overlay Design

Design standards related to Overlay design are essentially based on the guidelines given in IRC: 81 - 1997 "Guidelines for Strengthening of Flexible Road Pavements Using

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Benkelman Beam Deflection Technique". The suggested design values / standards and recommended values based on site conditions and data analysis are detailed in Table 3.4 and are adapted in the design.

Table 3.4: Overlay Design Standards

Sl. No.	Design Parameters	Reference Code / Design Values
1.	Overlay Design	IRC: 81 - 1997 "Guidelines for Strengthening of Flexible Road Pavements Using Benkelman Beam Deflection Technique"
	• Design Life	10 years
	• Correction Factors	Temperature Correction Factor. Correction for Seasonal Variation (inclusive of correction for moisture content, soil type and rainfall)
	• Minimum Thickness	From structural considerations recommended minimum bituminous overlay thickness is 40 mm AC (minimum) or 50mm BM (as required) + 40mm BC
2.	Wearing Course Material (Options)	Bituminous Concrete with Crumb Rubber Modified Bitumen / Plastic Waste.

3.5 Design Standards Related to Road Drainage

Drainage of water from pavement surface is of paramount importance as far as preserving the road assets created by investing huge funds in addition to maintaining the structural soundness and functional efficiency of the road. Design standards related to road drainage are essentially based on the guidelines given in IRC: SP: 42 — 1994 "Guidelines on Road Drainage" and in IRC: SP: 50 - 1999 "Guidelines on Urban Drainage". The suggested design values / standards are detailed in **Table 3.5.**

Table 3.5: Design Standards Related to RoadDrainage

Sl No.	Design Parameters	Design Values
1.	• Camber	1.7 - 2.5 % (bi - directional) for carriageway (camber of 3% is adopted).
	• Longitudinal Gradient	Minimum 0.3 - 0.5% for satisfactory drainage
	• Drain Type	Cast in situ RCC box drain with Precast RCC cover slab. RCC box culverts across cross roads.
	• For Existing Drains	Desilting and Rectification of Damaged Portion

3.6 Design Standards Related to Road Furniture and Appurtenances

Utility and importance of the road are greatly enhanced by installing road furniture and appurtenances at appropriate locations along the project road, which ensures improved road safety. Planning and design of road furniture and appurtenances are as per the guidelines

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stipulated in IRC. Detailing of each of these components has been done so as to integrate the same with the road improvement scheme. The suggested design values / standards are detailed in **Table 3.6.**

Table 3.6: Design Standards Related to Road Furniture and Appurtenances

SL No.	Design Parameters	Reference Code / Design Values
1.	Road Markings	IRC: 35 - 1997 "Code of Practice for Road Markings".
2.	Road Signs	IRC: 67 - 2001 "Code of Practice for Road Signs".
3.	Road Delineators	IRC: 79 - 1981 "Recommended Practice for Road Delineators".
4.	Pedestrian Facilities	IRC: 103 - 1988 "Guidelines for Pedestrian Facilities".

In addition to the above measures various other integral road components have been planned so as to achieve the maximum and optimal use of the carriageway with no / least interference to traffic flow at the same time ensuring adequate facilities to other road users especially pedestrians. All the encroachments, if any shall be cleared within the RoW.

3.7 Design Standards Related to Bridges and CD Structures

The design standards and loading considered for culverts and bridges are as stipulated in latest IRC codes / Special publications supplemented by appropriate MOST circulars and/or IS codes. The unsafe and/or deficient bridge and culvert structures (existing) will be rehabilitated or replaced by sound structures.

Chapter 4

DESIGN & PROPOSALS

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Chapter -4
DESIGN & PROPOSALS

4.1 General

Improvement proposals for an existing road section essentially consist of two components, geometric and structural improvements. Geometric improvement deals with visible dimensions of roadway, probable road widening and is dictated by the traffic and economic considerations. Due to the inherent restrictions like limitation in land acquisition, limited right of way and existing utilities / services, etc. the horizontal and vertical alignments in general follow the existing geometry except in situations where improvements are possible. The geometric improvements mainly involve improvements to cross sectional elements such as carriageway, shoulders, etc. The structural component deals with the pavement and embankment design aspects, i.e., the ability of the roads to adequately carry and support the Vehicle / wheel loads over the design period. Safety, speed, efficiency, economy and comfort in traffic movement to a large extent are governed by adequacy of design standards used for a specific road facility.

The improvement proposals need to consider the method of widening like concentric or eccentric to the existing road which is dictated by site situations like available land for acquisition, curvature, existing utilities, terrain, places of worship, monuments, grave yards, places of importance etc.

This chapter deals with the analysis of data collected during various engineering surveys/investigations and the formulation of improvement proposals including planning and design.

4.2 Road Inventory and Physical Characteristics of Road Section

Investigations / studies have been carried out along the Project Stretch. Physical characteristics of these road and road Junctions are as follows.

The Project includes Improvements and Asphalting to Main and cross roads of 407 SFS Yelahanka New Town. The Project area is falls under Yelahanka Division, Yelahanka Assembly Constituency in Bangalore City. The Project area is located thickly populated Residential cum Commercial area. The Project Stretch includes connecting roads and cross roads. For the habitation resided in this area it was very difficult to commute on this stretch in the Rainy season due to non proper flow of water on the Roads and lack of proper drainage facility. By considering these reasons the roads are taken up for Development with Asphalting or White topping depending upon the site

scenario.

Terrain along this section is generally plain. Width of Carriageway (Undivided Carriage Way and Divided Carriage Way) along the Road varies. The Road carries considerable vehicular traffic throughout the day especially during peak hours. Considerable pedestrian traffic is also present along the corridor.

4.3 Pavement Design

Pavement design forms an integral part of detailed engineering study. Performance of pavement is critical as the economical returns are directly dependent on its performance. This chapter deals with the design methodology adopted for the construction, strengthening and rehabilitation of the existing carriageway and the also suggests the design approach for both flexible and rigid pavement for the new carriageway. This chapter also brings out the present condition of the project corridor, the pavement option study and suggests the best alternate design.

This Section describes the studies and investigation carried out on Traffic, existing pavement conditions, existing soil sub grade condition and existing embankment / Soil at OGL condition. New pavements are generally flexible, consisting of Granular Sub-base, Water Mix Macadam, Bituminous macadam and wearing course in Bituminous Concrete.

4.4 Pavement Design Methodology

Pavement design methodology includes two basic functions namely; design of strengthening and Widening for existing pavement and design of new crust for new Pavement to be adopted shall be decided based on life cycle cost analysis as a part of pavement design methodology, Accordingly, the following Methodology has been adopted in Pavement design.

Step 1: Various Pavement investigations have been carried out on the project corridor to assess the adequacy of the existing pavement crust. These investigations include:

- Visual Pavement Condition
- Visual shoulder condition
- BBD measurements
- Sub grade investigations
- Investigations on existing soil / granular layers

Step 2: Detailed material investigations have been conducted in the projected influence area and strength characteristics and availability of construction material has been determined.

Step 3: Design thickness of overlay has been estimated from IRC-81-1997 using estimated traffic level and characteristic deflection of particular homogeneous section. Estimated BM thickness is then adjusted to equivalent thickness of BC & DBM using conversion factors

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given in IRC 81-1997.

Step 4: Homogeneous sections for pavement design have been established and design traffic Loadings for each of them identified. Design of flexible pavement for new road has been carried out in accordance with guidelines of IRC-37-2012.

4.5 Flexible Pavement Design

4.5.1 Design CBR

Existing soil sub grade samples were collected through Trial Pit excavations at Road and shoulder interface. The existing soil sub grade were tested as per IS 2720.

The equivalent CBR is obtained as per IRC 37-2012 Chart for 905 dependability is 10%. Hence the flexible pavement design has been carried out using the IRC code (IRC-37-2012). In this code, pavement designs have been extended to cover up to 150msa and design CBR strengths up to 15%. In order to compute the damage ratio, the allowable repetitions are calculated in terms of the fatigue and rutting. The pavement design was done as per IRC-37-2012 and IIT Pave software. It accepts layer thickness, loading and material characteristics as inputs and has provisions for entering various indigenous data such as rutting and fatigue coefficients, wheel spacing, tyre pressure etc. The analysis is based on the linear elastic, multilayer theory and the stresses and strains developed in various layers of the pavement are obtained.

4.5.2 Design Life for Base and Sub-base Layers

The stage construction for first five years of pavement life is considered as an option. It would be appropriate to design the bottom non bituminous layers (base and sub-base) for axle loads expected in the 15 year design period the upper bituminous layers for axle loads expected at the end of 10 year design period. A 15-years design life has been considered for Base and Sub-base layers of flexible pavement.

4.5.3 Traffic Considerations

The base year traffic, traffic growth and the projected traffic for the design period for each category of vehicles have been arrived from the Traffic Studies. The commercial vehicle considered for the design are based on the vehicular projections considering the actual traffic, the traffic likely to be generated by future developments in the vicinity of the project road. Further, based on the traffic studies the number of commercial vehicles has been adopted.

4.5.4 Traffic Loading

In accordance with the requirement of IRC: 37-2012, the traffic loading for the design period and design lane are to be assessed. Vehicles constituting the commercial vehicles are LCV, 2 Axles, 3 Axles and Multi Axles and Multi Axle Semi Articulated vehicles.

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4.5.5 Design Approach and Criteria of Flexible pavement

Pavement distress resulting from repeated application of traffic;

- Horizontal tensile strain at the bottom of the bituminous layer
- Vertical compressive strain at the top of the Sub grade

4.5.6 Design Standards Related to Pavement Design

Design standards related to pavement design are essentially based on the guidelines given in IRC: 37-2012 – "Tentative Guidelines for Design of Flexible Pavements".

Table 4. 1 Pavement Design Standards

	Design Parameters	Reference Code / Design Values
1.	Pavement Design	IRC: 37-2012- "Tentative Guidelines for Design of Flexible Pavements"
	Traffic Growth Rate	Adopted as per IRC: 37-2012
	Design Life	10 to 15 years
	Vehicle Damage Factor	Derived values based on Axle load survey. If these values are less than national average, then national average will be used.
	Lane Distribution Factor	As per IRC:37-2012
2.	Wearing Course Material	Bituminous Concrete

4.5.7 Information required for estimating design traffic

- Initial traffic in terms of number of Commercial Vehicles per day (CVPD).
- Traffic growth rate during the design life in percentage.
- Design life in number of years.
- Spectrum of axle loads.
- Vehicle Damage Factor (VDF).
- Distribution of commercial traffic over the carriageway.

4.5.8 Computation of Design Traffic

The design traffic in terms of the cumulative number of standard axles to be carried during the design life of the road should be computed using the following equation:

$$N = \frac{365 * \left[(1+r)^n - 1\right]}{r} * A * D * F$$

Where,

N = Cumulative number of repetitions in terms of million standard axles

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A = Initial traffic in the year of completion of construction in terms of the number of Commercial Vehicles per Day (CVPD).

D = Lane distribution factor (as explained in Para 4.5.1 (IRC: 37-2012)

F = Vehicle Damage Factor (VDF).

n = Design life in years.

r = Annual growth rate of commercial vehicles in decimal (e.g., for 5 per cent annual growth rate, r = 0.05).

Traffic Growth Rate

The present day traffic has to be projected for the end of design life at growth rates ('r') estimated by studying and analyzing the following data:

(i) The past trends of traffic growth; and

(ii) Demand elasticity of traffic with respect to macro-economic parameters (like GDP or SDP) and expected demand due to specific developments and land use changes likely to take place during design life.

If the data for the annual growth rate of commercial vehicles is not available or if it is less than 5 per cent, a growth rate of 5 per cent should be used.

The traffic in the year of completion is estimated using the following formula:

$$A = P(1+r)^n$$

Where,

P = Number of commercial vehicles as per last count.

n = Number of years between the last count and the year of completion of construction

4.5.9 Selection of Subgrade CBR for Pavement Design

The CBR values of the sub grade soil vary along a proposed alignment even on a homogeneous section. The pavement design is done based on Considering the CBR of Borrow area for Reconstruction and Widening Section and For Existing portion the CBR of Existing Sub grade / Sub base is considered.

4.5.10 Flexible Pavement Design – Re-construction

The CBR values of the subgrade soil vary along a proposed alignment even on a homogeneous section. The pavement design is done based on Considering the CBR of Borrow area for Reconstruction and Widening Section and For Existing portion the CBR of Existing Subgrade/Sub base is taken,

4.5.11 Widening Proposals & Typical Cross Sections

a) Widening options for the project road were arrived based on,

- Lane requirements based on traffic capacity analysis.

A = Initial traffic in the year of completion of construction in terms of the number of Commercial Vehicles per Day (CVPD).

D = Lane distribution factor (as explained in Para 4.5.1 (IRC: 37-2012)

F = Vehicle Damage Factor (VDF).

n = Design life in years.

r = Annual growth rate of commercial vehicles in decimal (e.g., for 5 per cent annual growth rate, r = 0.05).

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The present day traffic has to be projected for the end of design life at growth rates ('r') estimated by studying and analyzing the following data:

(i) The past trends of traffic growth; and

(ii) Demand elasticity of traffic with respect to macro-economic parameters (like GDP or SDP) and expected demand due to specific developments and land use changes likely to take place during design life.

If the data for the annual growth rate of commercial vehicles is not available or if it is less than 5 per cent, a growth rate of 5 per cent should be used.

The traffic in the year of completion is estimated using the following formula:

$$A=P\,(1+r)^n$$

Where,

P = Number of commercial vehicles as per last count.

n = Number of years between the last count and the year of completion of construction

4.5.9 Selection of Subgrade CBR for Pavement Design

The CBR values of the sub grade soil vary along a proposed alignment even on a homogeneous section. The pavement design is done based on Considering the CBR of Borrow area for Reconstruction and Widening Section and For Existing portion the CBR of Existing Sub grade / Sub base is considered.

4.5.10 Flexible Pavement Design – Re-construction

The CBR values of the subgrade soil vary along a proposed alignment even on a homogeneous section. The pavement design is done based on Considering the CBR of Borrow area for Reconstruction and Widening Section and For Existing portion the CBR of Existing Subgrade/Sub base is taken,

4.5.11 Widening Proposals & Typical Cross Sections

a) Widening options for the project road were arrived based on,

- Lane requirements based on traffic capacity analysis.

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- Requirement of service roads along built-up areas.
- Presence of religious structures.
- Availability of land

Formulation of carriageway widening schemes involves 1) estimation of extent of widening required in terms of additional lanes and 2) lateral arrangement of these additional lanes to the existing carriageway. Guidelines for the requirement of additional lanes is derived from, Traffic Study – Projected Traffic Volume vis-à-vis Capacity of each lane / road

Based on the TOR requirement of minimum Land Acquisition, i.e., within the existing ROW as far as possible, and retaining the existing pavement, cross drainage structures and bridges as far as possible, without compromising the recommendations of IRC / MORT&H.

Requirement of service roads along built-up areas. Additional lanes shall be added to the existing road either concentrically or eccentrically, depending on

1. The availability of right of way on either side of the existing centre line,
2. Topography and built-up areas
3. Due to specific field constraints (such as any sensitive features like water bodies, important structures etc.), localized shifting has been emerged at many places.

4.6 Proposed Improvements to Road Section

The proposals for the improvement of the geometric elements of the existing project road sections generally include:

a. Geometric Improvements

- Maintaining Uniform Carriageway.
- Improvements to cross sectional elements.

b. Strengthening of Existing Pavement

- Filling of potholes / damaged portion with WMM.
- Overlay for existing carriageway.
- Strengthening of Carriage way.

c. Road Drainage

- Desilting of Existing Side Drains.
- Rectification of damaged drains.
- Flagging Coarse for Existing Drain.
- Replacing damaged / Missing cover slabs.

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Annexure A.4.1

FLEXIBLE PAVEMENT DESIGN

DESIGN TRAFFIC:

The following equation is used to compute the design traffic in terms of the cumulative number of standard axles.

$$Ns = \frac{365 \times ((1+r)^{n} - 1)}{R} \times A \times D \times F$$

Where,

Ns = Cumulative number of standard axles to be catered for in the design, MSA.

A = Initial Traffic

r = Annual growth rate of commercial vehicles

n = Design life in years

F = Vehicle Damage Factor

D= Lane distribution factor

The design traffic computed in terms of cumulative number of standard axles (msa).

City roads should be designed for minimum 2 msa traffic. (As per IRC 37 – 2012, Page No. 25, Plate 5)

The composition of pavement layers from the above Detailed Design is shown in table below.

Pavement compositions

Recommended for Surface course of 2 MSA		Recommended Base course of 2 MSA	
BC	**DBM**	**WMM**	**GSB**
30	50	200	150

5 (CBR 7%)

FLEXIBLE PAVEMENT OVERLAY DESIGN

FLEXIBLE OVERLAY DESIGN:

DESIGN TRAFFIC:

The following equation is used to compute the design traffic in terms of the cumulative number of standard axles.

$$N_s = \frac{365 \times ((1+r)^n - 1)}{R} \times A \times D \times F$$

Where,

Ns = Cumulative number of standard axles to be catered for in the design, MSA.

A = Initial Traffic, in terms of commercial vehicles per day modified to account for lane distribution.

r = Annual growth rate of commercial vehicles

n = Design life in years

F = Vehicle Damage Factor

D= Lane distribution factor

The design traffic computed in terms of cumulative number of standard axles (msa).

Pavement compositions

Recommended for Surface course of 2 MSA		Recommended Base course of 2 MSA	
BC	**DBM**	**WMM**	**GSB**
40	50	Bad Reaches	

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(Km)	(Div)	(Div)	(Div)	(mm)	(^{o}C)		(mm)	(mm)	(mm)
0.000	100	84	82	0.36	37	-0.02	0.34	0.36	
0.050	100	70	62	1.23	37	-0.02	1.21	1.27	
0.100	100	62	56	1.23	37	-0.02	1.21	1.27	
0.150	100	74	72	0.56	37	-0.02	0.54	0.57	
0.200	100	62	58	1.07	37	-0.02	1.05	1.11	
0.250	100	80	74	0.87	37	-0.02	0.85	0.89	
0.300	100	74	72	0.56	37	-0.02	0.54	0.57	
0.350	100	70	62	1.23	37	-0.02	1.21	1.27	
0.400	100	68	66	0.68	37	-0.02	0.66	0.69	
0.450	100	70	68	0.64	37	-0.02	0.62	0.65	
0.500	100	78	76	0.48	37	-0.02	0.46	0.48	0.857
0.550	100	80	78	0.44	37	-0.02	0.42	0.44	
0.600	100	72	70	0.60	37	-0.02	0.58	0.61	
0.650	100	66	60	1.15	37	-0.02	1.13	1.19	
0.700	100	70	68	0.64	37	-0.02	0.62	0.65	
0.750	100	72	66	1.03	37	-0.02	1.01	1.06	
0.800	100	76	74	0.52	37	-0.02	0.50	0.53	
0.850	100	66	64	0.72	37	-0.02	0.70	0.74	
0.900	100	52	46	1.43	37	-0.02	1.41	1.48	
0.950	100	74	64	1.30	37	-0.02	1.28	1.35	

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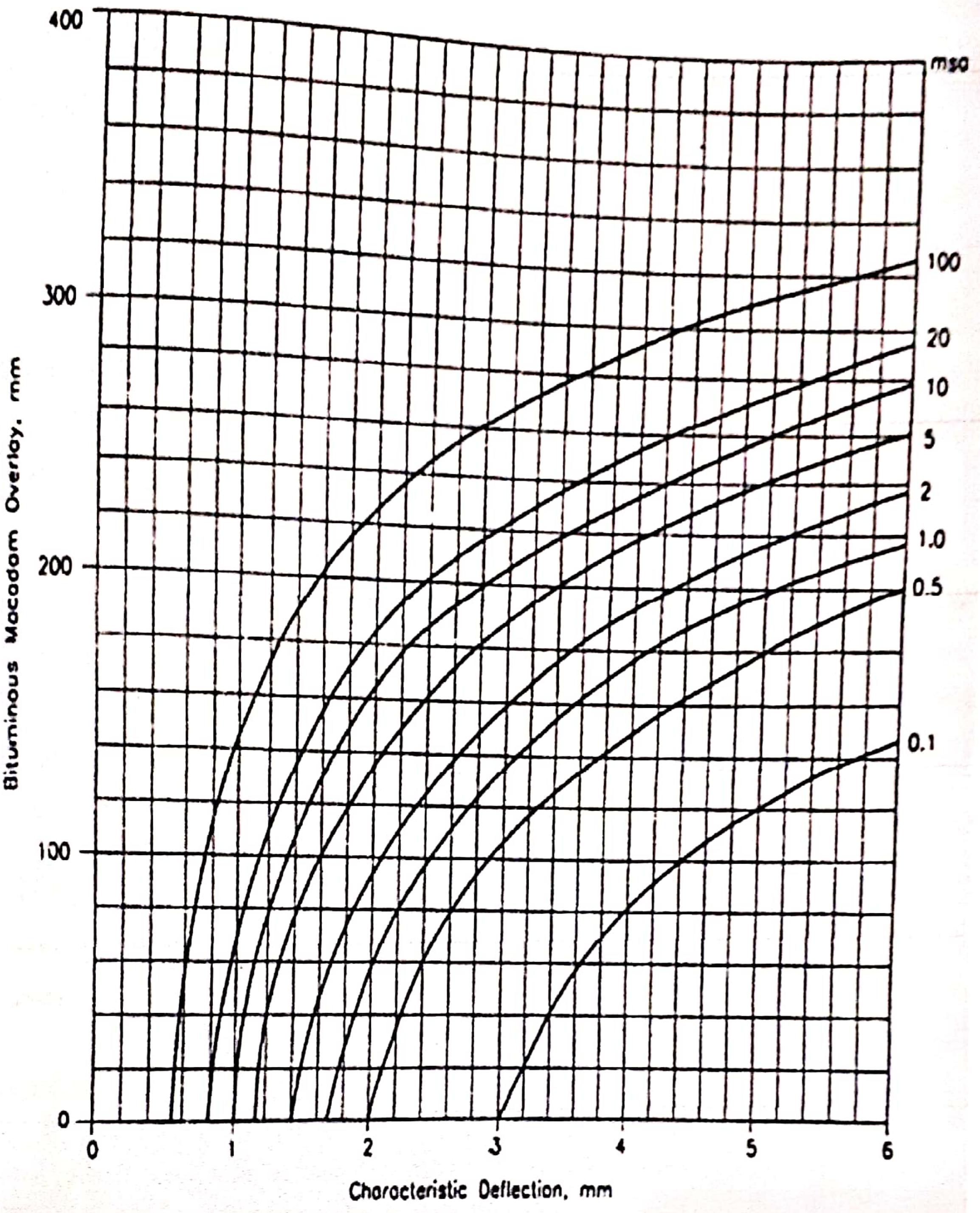

The thickness deduced from Fig. 9 is the overlay thickness in terms of minous macadam construction. In case other compositions are to be laid for ngthening, the equivalent overlay thickness to be provided may be determined g appropriate equivalency factors as suggested below :

1 cm of Bituminous macadam	= 1.5 cm of WBM/Wet Mix Macadam/BUSG
1 cm of Bituminous macadam	= 0.7 cm of DBM/AC/SDC

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Chapter - 5
PROJECT COST ESTIMATES

5.1 Detailed Cost Estimate

Detailed cost Estimate has been worked out based on detailed engineering design

5.2 General

Cost Estimate is an important part of the Report as it provides vital input to financial evaluation of the project. The cost estimates have been prepared for Strengthening of the existing road including strengthening of longitudinal drains, road furniture, site clearance and Dismantling.

5.3 Basic rates

As part of Report, Rate Analysis of each of the item has been prepared by adopting PW, P & IWTD SR 2018 - 19, Bangalore Circle. The rates as given in PW, P & IWTD SR are to be enhanced by 6% for additional weightages for the works to be executed under extra ordinary conditions for Bangalore Metropolitan Limits. Items not covered in NHSR / PW, P & IWTD SR have been based on market rates.

5.4 Project Management and Quality Control

Provision of around 2.0% of Construction Cost has been made towards Cost of DPR Preparation, Quality Control, PMC and Proof Checking.

5.5 Project Cost

The total project cost for the proposed work is 200.00 Lakh.

Detailed Cost Estimate is enclosed in **Annexure A. 5.1**

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Annexure A. 5.1

DETAILED COST ESTIMATE

RATE ANALYSIS

DRAFT TENDER SCHEDULE

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Bruhat Bangalore Mahanagara Palike

Excecutive Engineer Road Infrastructure Yelahanka Division

Project Cost: 200.00Lakhs

Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura

Sl No	Description of Items	No	Length	Width	Depth	Quantity	Unit	Rate	Amount
	Civil Work								
1	**Removing and refixing stone slabs** of drains and pointing in CM (1:3) (P.No-27,I No-5.33 of PWD BCSR 2018-19)								
	Top slab								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	1.20		720.00			
						720.00			
	consider 50%					360.00			
	Deduct 20% missing/damaged					72.00			
						288.00			
						288.00	**Sqm**	**111.30**	**32,054.40**
2	KSRRB 300-1. **Earthwork excavation by manual means** for roads, drains & similar works in ordinary soil excavated surface levelled and sides neatly dressed, the disposed earth to be levelled neatly after breaking of clods complete as per specifications (P.No-143 &136 ,I No-19.1&17.4& 17.1 of PWD BCSR 2018-19) 6km lead= 57+2.0x1.28x6 =72.36, including the cost of loading and unloading, disposal using private vehicle and lead off of 6km								
	Desilt								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	0.60	0.40	144.00			
	Kempegowda circle to Aarav Systems	2	280.00	0.60	0.40	134.40			
	KV Jairam Rd to Aarav systems	1	300.00	0.60	0.40	72.00			
	Balaji layout								
	Road 1	2	78.00	0.50	0.35	27.30			
	Road 2	2	98.00	0.50	0.35	34.30			
	Road 3	2	54.00	0.50	0.35	18.90			
						430.90	**Cum**	**214.50**	**92,428.74**
3	KSRRB M300-14. **Excavation for roadwork** in all types of soil by mechanical means including cutting and loading to tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transportation with a lead of 6.00 km and complete as per specifications MORTH Specificatio MORTH Specification No.301Loading and unloading with 5km lead= (I No-19.14,P No-143 of PWD BCSR 2018-19) , 5km lead= 2.0x1.28x5 =12.8 , including the cost of loading and unloading, disposal using private vehicle and lead off of 6km								
	Debris								
		1	30.00	1.50	0.40	18.00			
	RCC Drain								
	KV Jairam Rd to Aarav systems	1	250.00	1.00	0.90	225.00			
	Kempegowda circle to Aarav Systems	1	60.00	1.00	0.90	54.00			
	Culvert	1	9.00	2.00	1.00	18.00			
		2	7.00	1.50	1.00	21.00			
	Balaji layout								
	Road								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	1.00	0.30	180.00			
	Kempegowda circle to Aarav Systems	2	330.00	2.00	0.30	396.00			

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No	Length	Width	Depth	Quantity	Unit	Rate	Amount
2	325.00	1.25	0.30	243.75			
1	5.00	2.50	0.10	1.25			
1	12.00	3.00	0.10	3.60			
1	8.00	2.50	0.10	2.00			
1	10.00	2.60	0.10	2.60			
1	6.00	2.80	0.10	1.68			
1	78.00	5.00	0.30	117.00			
1	98.00	5.00	0.30	147.00			
1	54.00	5.00	0.30	81.00			
2	300.00	2.00	0.30	360.00			
2	330.00	2.00	0.30	396.00			
1	325.00	1.80	0.30	175.50			
				2443.38	**Cum**	**57.03**	**139341.07**

ain **cement concrete of mix 1:3:6** with OPC @ 220kgs, with ite metal coarse aggregates @0.89cum and fine aggregates mixed, placed in foundation and compacted by vibration cost of all materials, labour, HOM curing, form works, specifications. (P.No-222, I No-27.18)

No	Length	Width	Depth	Quantity	Unit	Rate	Amount
1	250.00	1.00	0.10	25.00			
1	60.00	1.00	0.10	6.00			
1	9.00	2.00	0.15	2.70			
2	7.00	1.50	0.15	3.15			

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Sl No	Description of Items	No	Length	Width	Depth	Quantity	Unit	Rate	Amount
6	KSRB 4.9.2 : **Providing T.M.T steel reinforcement** for R.C.C work including straightening, cutting, bending, hooking, placing in position, lapping and / or welding wherever required, tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) cost of materials, labour, HOM complete as per specifications. Specificatio (I No-28.8.2,P No-229)								
	For Drain, 50kg/cum	78.78	50.00			3.94			
						3.94	**Tn**	**72326.98**	**284910.44**
7	**Providing and constructing granite / trap / basalt size stone** masonry in foundation with cement mortar & stone hammerd dressed in courses not less than 20 cms high, bond stones at 2m. apart in each course including cost of materials, labour, HOM, curing complete as per specifications. KBS 5.1.13 cement mortar 1:6 (Page No 25., I.No.34.8.2).								
	Drain coping	2	280.00	0.45	0.200	50.40			
						50.40	**Cum**	**4871.76**	**245536.70**
8	Providing and laying in position **plain cement concrete of mix 1:2:4** with cement @ 240kgs, with 20mm and down size graded granite metal coarse aggregates @ 0.69 cum and fine aggregtes @ 0.459cum, machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, for coping. Including cost of all materials, labour, HOM, curing complete as per specifications. Specification No. KBS 4.1, 4.2. (P.No-255, I No-34.11)								
	Drain coping	2	280.00	0.45	0.100	25.20			
						25.20	**Cum**	**5599.98**	**141119.50**
9	Providing and fixing **RCC Precast cover slab of 250mm thick** for drain in cement concrete M20 using graded granite jelly 20mm and down size with steel reinforcement, including form work, lift charges, curing and concrete finished surfaces on both sides etc, complete and as per drawing and the directions of Engineer in-charge. (Data Rate)								
	Culvert	1	9.00	1.80		16.20			
	Balaji layout	2	7.00	1.20		16.80			
						33.00	**Sqm**	**3640.00**	**120120.00**
10	Providing and laying **100mm thick pre-cast cover slabs** over drains of width not exceeding 800 mm using M20 concrete reinforced with steel @ 6.00 kg/Sqm, slabs jointed in CM 1:3 proportion and nicely finished including providing holes in the Cover slabs wherever necessary for easy drainage of surface water including of labour, materials, HOM of machineries, curing, lead and lift charges etc, Complete as per MORTH specifications No. 1500, 1700. (P.No-272 ,I No-37.66 of PWD BCSR 2018-19)								
	RCC Drain								
	KV Jairam Rd to Aarav systems	1	250.00			250.00			
	Kempegowda circle to Aarav Systems	1	60.00			60.00			
	For old drain	1	220.00			220.00			
	Drain coping	1	280.00	1.20		336.00			
	frm item No-1 top slabs		72.00			72.00			
						938.00	**m**	**1145.86**	**1074816.68**
11	KSRB 14.6 : Providing and laying **heavy duty cobble stones interlock pavers**, 60mm thick using cement and course sand for manufacture of blocks of approved size, shape and colour with a minimum compressive strength of 281 kg per sqm over 50mm thick sand bed (average thickness) and compacting with plate vibrator having 3 tons compaction force thereby forcing part of sand underneath to come up in between joints, final compaction of paver surface joints into its final level, including cost of materials, labour and HOM complete as per specifications. Specification No. KBS (P.No-103,I No-14.7 of PWD BCSR 2018-19),75mm thick								
	Footpath								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	2.00		1200.00			

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Sl No	Description of Items	No	Length	Width	Depth	Quantity	Unit	Rate	Amount
	Kempegowda circle to Aarav Systems	2	330.00	2.00		1320.00			
	KV Jairam Rd to Aarav systems	1	325.00	1.80		585.00			
						3105.00	Sqm	1176.60	3653343.00
12	Providing and fixing pre cast solid **cement concrete kerb stones** made out of CC 1:2:4 with top and bottom width 114 and 165 mm respectively, 400mm high and 450mm in length finished with CM 1:3 plastering and finishing cutting including formwork, curing, including cost of materials, labour charges of machinery, loading and unloading, lead and lift, transportation ete.,complete. (I No-5.30,P No-27 of PWD BCSR 2018-19)								
	KV Jairam Rd to Aarav systems	1	250.00			250.00			
	Kempegowda circle to Aarav Systems	2	280.00			560.00			
	Kempegowda circle to KV Jairam Rd	1	300.00			300.00			
						1110.00			
	Length/Length of Kerb= No of Kerb					2220.00			
						2220.00	Nos	432.48	960105.60
13	KSRRB 800-1. **Painting two coats** after filling the surface with synthetic enamel paint in approved shades on new plastered concrete surfaces, with materials, labour complete as per specifications.(I No-24.1,P No-180)								
	KV Jairam Rd to Aarav systems	1	250.00		0.30	75.00			
	Kempegowda circle to Aarav Systems	2	280.00		0.30	168.00			
	Kempegowda circle to KV Jairam Rd	1	300.00		0.30	90.00			
						333.00	Sqm	84.80	28,238.40
14	Construction of **granular sub-base Grading-V** as Sub-base and drainage layer by providing coarse graded crushed stone aggregates of granite/trap/basalt material, mixing by mix in place method by rotavator at OMC,spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the 98 % proctor density, complete as per specifications. Clause 401 of MORTH V Revision.(I No-20.6,P No-153 of PWD BCSR 2018-19)								
	Road								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	1.00	0.150	90.00			
	Kempegowda circle to Aarav Systems	2	330.00	1.00	0.150	99.00			
	KV Jairam Rd to Aarav systems	2	325.00	1.25	0.150	121.88			
	Bad Reaches								
		1	5.00	2.50	0.15	1.88			
		1	12.00	3.00	0.15	5.40			
		1	8.00	2.50	0.15	3.00			
		1	10.00	2.60	0.15	3.90			
		1	6.00	2.80	0.15	2.52			
	Balaji layout								
	Road 1	1	78.00	5.00	0.15	58.50			
	Road 2	1	98.00	5.00	0.15	73.50			
	Road 3	1	54.00	5.00	0.15	40.50			
						500.07	Cum	1855.00	927629.85
15	KSRRB M400-17. Providing, laying, spreading and compacting cushed stone aggregates of granite / trap / basalt to **wet mix macadam** specifications including pre mixing the material with water at OMC in mechanical mix plant carriage of mixed materials by tipper to site, laying in uniform layers with paver in sub-base/base course on well prepared surface and compacting with vibratory roller to achieve the desired density complete as per specifications(P.No-155,I No-20.18 of PWD BCSR 2018-19)								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	1.00	0.225	135.00			
	Kempegowda circle to Aarav Systems	2	330.00	1.00	0.225	148.50			

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	KV Jairam Rd to Aarav systems	2	325.00	1.25	0.225	182.81			
	Bad Reaches								
		1	5.00	2.50	0.225	2.81			
		1	12.00	3.00	0.225	8.10			
		1	8.00	2.50	0.225	4.50			
		1	10.00	2.60	0.225	5.85			
		1	6.00	2.80	0.225	3.78			
	Balaji layout								
	Road 1	1	78.00	5.00	0.20	78.00			
	Road 2	1	98.00	5.00	0.20	98.00			
	Road 3	1	54.00	5.00	0.20	54.00			
	Footpath								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2	300.00	2.00	0.150	180.00			
	Kempegowda circle to Aarav Systems	2	330.00	2.00	0.150	198.00			
	KV Jairam Rd to Aarav systems	1	325.00	1.80	0.150	87.75			
						1187.11	**Cum**	**2001.28**	**2375729.49**
16	KSRRB M 500-6, Providing and applying **primer coat** with SS bitumen emulsion on prepared surface of granular Base such as WBM WMM including clearing of road surface and spraying primer at the rate of 0.60 kglsqm using mechanical means complete as per specifications. As per MORTH specification clause No. 502 (P.No.158, I.No.21.6 of PWD BCSR 2018-19) issue rate Dated 01-01-2019								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	1	300.00	7.00		2100.00			
	Kempegowda circle to Aarav Systems	1	330.00	7.00		2310.00			
	KV Jairam Rd to Aarav systems	1	325.00	7.50		2437.50			
	Junction Asphalt	3	14.00	8.00		336.00			
	Balaji layout								
	Road 1	1	78.00	5.00		390.00			
	Road 2	1	98.00	5.00		490.00			
	Road 3	1	54.00	5.00		270.00			
						8333.50	**Sqm**	**29.68**	**247338.28**
17	KSRRB 500-2. **Cleaning the existing black topped surface** with brooms, soft brushes and finally dusting with old gunny bags and / or compressed air to receive bituminous treatment including cost of all materials, labour, HOM complete as per specifications. (P.No-158,I No-21.2 of PWD BCSR 2018-19)								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	1	300.00	5.00		1500.00			
	Kempegowda circle to Aarav Systems	1	330.00	5.00		1650.00			
	KV Jairam Rd to Aarav systems	1	325.00	5.50		1787.50			
	Junction Asphalt	3	14.00	8.00		336.00			
						5273.50	**Sqm**	**5.30**	**27,949.55**
18	KSRRB 500-7. Providing and applying **tack coat** using 80/100 grade bitumen(VG10) on the prepared black topped surfaces at 2.5 kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM complete as per specifications (P.No-158,I No-21.7 of PWD BCSR 2018-19) issue rate Dated 01-01-2019								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	1	300.00	7.00		2100.00			
	Kempegowda circle to Aarav Systems	1	330.00	7.00		2310.00			
	KV Jairam Rd to Aarav systems	1	325.00	7.50		2437.50			
	Junction Asphalt	3	14.00	8.00		336.00			

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	Balaji layout								
	Road 1	1	78.00	5.00		390.00			
	Road 2	1	98.00	5.00		490.00			
	Road 3	1	54.00	5.00		270.00			
						8333.50	**Sqm**	**12.72**	**106002.12**
19	KSRRB M500-17. Providing and laying **dense graded bituminous macadam** using crushed aggregates of specified grading, premixed with VG30 grade bituminous binder and, transporting the hot mix to work site, laying to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications Clause 505 of MORTH V revisionusing 40/60 TPH capacity H.M.P. with Mechanical paver Gr-II (50 mm to 75 mm) with 4.5 % VG-30 Bitumen (P.No-160,I No-21.17.6 of PWD BCSR 2018-19) issue rate Dated 01-01-2019								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	1	300.00	7.00	0.05	105.00			
	Kempegowda circle to Aarav Systems	1	330.00	7.00	0.05	115.50			
	KV Jairam Rd to Aarav systems	1	325.00	7.50	0.05	121.88			
	Junction Asphalt	3	14.00	8.00	0.05	16.80			
	Balaji layout								
	Road 1	1	78.00	5.00	0.05	19.50			
	Road 2	1	98.00	5.00	0.05	24.50			
	Road 3	1	54.00	5.00	0.05	13.50			
						416.68	**Cum**	**6858.20**	**2857640.49**
20	Providing and laying **bituminous concrete** 40mm thick with hot mix plant, using crushed aggregates of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site, laying with a paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications. Clause 507 of MORTH V revision as per IRC SP-53-2015. using – do – using 40-60 TPH capacity HMP with mechanical paver grading II (30-45mm) with 5.4 % of modified bituminus binder consisting of 4.97% of VG-30 bitumen (60/70 grade) and 0.43% of plastomeric thermoplastics (waste plastic) (P.No.171, I.No.21.78.12 of PWD BCSR 2018-19) issue rate Dated 01-01-2019								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	1	300.00	7.00	0.04	84.00			
	Kempegowda circle to Aarav Systems	1	330.00	7.00	0.04	92.40			
	KV Jairam Rd to Aarav systems	1	325.00	7.50	0.04	97.50			
	Junction Asphalt	3	14.00	8.00	0.04	13.44			
	Balaji layout								
	Road 1	1	78.00	5.00	0.03	11.70			
	Road 2	1	98.00	5.00	0.03	14.70			
	Road 3	1	54.00	5.00	0.03	8.10			
						321.84	**Cum**	**8049.64**	**2590696.14**
21	KSRRB M800-13.**Road Marking with Hot Applied Thermoplastic** Compound with Reflectrising Glass Beads on Bituminous Surface/ Concrete Surface: Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads at 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 standards specified. The finished surface to be level, uniform and free from streaks and holes complete as per specifications. MORTH Specification No. 803(P.No-182,I No-24.15 of PWD BCSR 2018-19)								
	Jakkuru								
	Kempegowda circle to KV Jairam Rd	2.5	300.00	0.10		75.00			
	Kempegowda circle to Aarav Systems	2.5	330.00	0.10		82.50			
	KV Jairam Rd to Aarav systems	2.5	325.00	0.10		81.25			

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Sl No	Description of Items	No	Length	Width	Depth	Quantity	Unit	Rate	Amount
	Balaji layout								
	Road 1	2	78.00	0.10		15.60			
	Road 2	2	98.00	0.10		19.60			
	Road 3	2	54.00	0.10		10.80			
						284.75	Sqm	454.74	129487.22
22	KSRRB M800-35. Supply and Installtion of Moulded Shank Raised Pavement Markers made of polycarbonate and ABS(Acrylonitrile Butadiene Styrene) moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 16000 kg tested in accordance to Specifications of Category A of MORTH Circular No RW/ NH/33023/10-97 – DO III Dt 11.06. 1997. The height, width and length shall not exceed 50 mm, 100 mm and 102 mm and with minimum reflective area of 13 Sqcm on each side and the slope to the base shall be 35 degree. The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 mm and height not less than 30 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturer's recommendation and complete as directed by the engineer.(P.No-187, I No-24.41 of PWD BCSR 2018-19)								
	Bhadrappa Layout Mn Rd	3	80			240.00			
						240.00	Nos	357.22	85,732.80
								Total Construction Cost	16893070.24
								4% KRIDL Charges	675722.81
								Sub Total 1	17568793.05
								12% GST for Sub total 1	2108255.17
								Towards DPR & PMC Cost including GST	322000.00
								Sub Total 2	19999048.21
								Utility Shifting,Miscellaneous and Rounding off	951.79
								GRAND TOTAL	20000000.00

19677125.52/-

Certificate

1. The workspot was inspected and works is found to be necessary.
2. The area comes within the Bruhat Bangalore Mahanagara Palike limits.
3. The rates adopted based on the PWD SR,Bangalore circle for year 2018-2019, issue rates dated 01-01-2019 and Data Rates

Assistant Engineer RI,Yelahanka Division BBMP Bangalore	Asst. Executive Engineer, RI,Yelahanka Division BBMP Bangalore	Executive Engineer, RI,Yelahanka Division BBMP Bangalore

Administratively sanctioned for Rs. 2,00,00,000/-
(Rs. two crores only)
under 2019-20 BBMP Grant P-9902 Escrow Account with SB No-121, 007-20-000034
Registered as ... AS/133/2019-20 subject to conditions enclosed in memo.
No. AS/133/2019-20 Dt. 10/10/2019
AE/JE 10/10/2019 TA CE (RI)

Technically sanctioned for Rs. 2,00,00,000/-
Rs. two crores only
under 2019-20 BBMP Grant P-9902 Escrow Account with SB No-121, 007-20-000034
Registered as C.E. No TS/91/2019-20 subject to conditions enclosed in memo.
No. TS/91/2019-20 Dt. 10/10/2019
AE/JE 10/10/2019 TA CE (RI)

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Sl No	Description of Items	No	Length	Width	Depth	Quantity	Unit	Rate	Amount
	Balaji layout								
	Road 1	2	78.00	0.10		15.60			
	Road 2	2	98.00	0.10		19.60			
	Road 3	2	54.00	0.10		10.80			
						284.75	Sqm	454.74	129487.22
22	KSRRB M800-35. Supply and Installtion of Moulded Shank Raised Pavement Markers made of polycarbonate and ABS(Acrylonitrile Butadiene Styrene) moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 16000 kg tested in accordance to Specifications of Category A of MORTH Circular No RW/ NH/33023/10-97 – DO III Dt 11.06. 1997. The height, width and length shall not exceed 50 mm, 100 mm and 102 mm and with minimum reflective area of 13 Sqcm on each side and the slope to the base shall be 35 degree. The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 mm and height not less than 30 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturer's recommendation and complete as directed by the engineer.(P.No-187, I No-24.41 of PWD BCSR 2018-19)								
	Bhadrappa Layout Mn Rd	3	80			240.00			
						240.00	Nos	357.22	85,732.80
	Total Construction Cost								16893070.24
	4% KRIDL Charges								675722.81
	Sub Total 1								17568793.05
	12% GST for Sub total 1								2108255.17
	Towards DPR & PMC Cost including GST								322000.00
	Sub Total 2								19999048.21
	Utility Shifting,Miscellaneous and Rounding off								951.79
	GRAND TOTAL								20000000.00

19677125.52/-

Certificate

1. The workspot was inspected and works is found to be necessary.
2. The area comes within the Bruhat Bangalore Mahanagara Palike limits.
3. The rates adopted based on the PWD SR,Bangalore circle for year 2018-2019, issue rates dated 01-01-2019 and Data Rates

Assistant Engineer RI,Yelahanka Division BBMP Bangalore	Asst. Executive Engineer, RI,Yelahanka Division BBMP Bangalore	Executive Engineer, RI,Yelahanka Division BBMP Bangalore

Administrative approval accorded for Rs. 2,00,00,000/-
(Rs. two crores only)
under Head 2019-20 RBMP Grant P2902 Escrow Account Bng Cal No-121, 007-20-0000034
Registered as AE No. AE/133/2019-20 subject to conditions enclosed in memo.
No. AE/133/2019-20 Dt. 10/10/2019
AE/JE 10/10/2019 TA CE (RI)

Technically sanctioned for Rs. 2,00,00,000/-
Rs. two crores only
under 2019-20 RBMP Grant P-2902 Escrow Account Bng Cal No-121, 007-20-0000034
Registered as C.E. No. TS/91/2019-20 subject to conditions enclosed in memo.
No. TS/91/2019-20 Dt. 10/10/2019
AE/JE 10/10/2019 TA CE (RI)

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Bruhat Bangalore Mahanagara Palike

Excecutive Engineer Road Infrastructure Yelahanka Division

Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura

RATE ANALYSIS

(Based on Schedule of Rates for the year 2018- 2019 PW, P&IWTD Bangalore Circle.

Sl. No.	Description of work	Unit	SR Page No	Item No.	Basic Rate in Rs.	Loading and Unloading in Rs	Sub total	AW 6%	Total Rate in Rs.
1	Removing and refixing stone slabs of drains and pointing in CM (1:3) (P.No-27,I No-5.33 of PWD BCSR 2018-19)	Sqm	27	5.3	105.00		**105.00**	6.30	**111.30**
2	KSRRB 300-1. Earthwork excavation by manual means for roads, drains & similar works in ordinary soil excavated surface levelled and sides neatly dressed, the disposed earth to be levelled neatly after breaking of clods complete as per specifications (P.No-143 &136 ,I No-19.1&17.4& 17.1 of PWD BCSR 2018-19) 6km lead= 57+2.0x1.28x6 =72.36, including the cost of	Cum	143	19.10	130.00	**72.36**	**202.36**	12.14	**214.50**
3	KSRRB M300-14. Excavation for roadwork in all types of soil by mechanical means including cutting and loading to tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transportation with a lead of 6.00 km and complete as per specifications MORTH Specificatio MORTH Specification No.301Loading and unloading with 5km lead= (I No-19.14,P No-143 of PWD BCSR 2018-19) , 5km lead= 2.0x1.28x5 =12.8 , including the cost of loading and unloading,	Cum	143	19.14	41.00	**12.80**	**53.80**	3.23	**57.03**
4	KSRRB M2100-10. Providing and laying Plain cement concrete of mix 1:3:6 with OPC @ 220kgs, with crushed 40mm and down size graded granite metal coarse aggregates @0.89cum and fine aggregates @ 0.46cum, in foundation mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days including cost of all materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. (P.No-222,I No-27.18)	Cum	222	27.18	5115.00		**5115.00**	306.90	**5421.90**

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Sl. No.	Description of work	Unit	SR Page No	Item No.	Basic Rate In Rs.	Loading and Unloading In Rs	Sub total	AH 6%	Total rate In Rs.
5	Providing and laying plain/reinforced cement concrete for side drains using M20 nominal mix concrete with OPC at 300 kgs. with 20mm and down size granite metal coarse aggregates at 0.69 cum and fine aggregates at 0.43 cum machine mixed, well compacted for walls and bottom including centering, shuttering, cost of materials, HOM of machinery, curing etc., complete excluding cost of steel as per MORTH specification No. 1500, 1700, 2200. including cost of materials, labour, HOM complete as per specificationsdo- Wall & bottom thickness 10cm (I No-37.59.1,P No-271 of PWD BCSR 2018-19)	Cum	271	37.59.1	6862.00		**6862.00**	411.72	**7273.72**
6	KSRB 4.9.2 : Providing T.M.T steel reinforcement for R.C.C work including straightening, cutting, bending, hooking, placing in position, lapping and / or welding wherever required, tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) cost of materials, labour, HOM complete as per specifications. Specificatio (I No-28.8.2,P No-229)	Tn	229	28.8.2	68233.00		**68233.00**	4093.98	**72326.98**
7	Providing and constructing granite / trap / basalt size stone masonry in	Cum	255	34.8.2	4596.00		**4596.00**	275.76	**4871.76**
8	Providing and laying in position plain cement concrete of mix 1:2:4 with	Cum	255	34.11	5283.00		**5283.00**	316.98	**5599.98**
9	Providing and fixing RCC Precast cover slab of 250mm thick for drain in cement concrete M20 using graded granite jelly 20mm and down size with steel reinforcement, including form work, lift charges, curing and concrete finished surfaces on both sides etc, complete and as per drawing and the directions of Engineer in-charge. (Data Rate)	Sqm	Data rate				**3640.00**	0.00	**3640.00**
10	Providing and laying 100mm thick pre-cast cover slabs over drains of width not exceeding 800 mm using M20 concrete reinforced with steel @ 6.00 kg/Sqm, slabs jointed in CM 1:3 proportion and nicely finished including providing holes in the Cover slabs wherever necessary for easy drainage of surface water including of labour, materials, HOM of machineries, curing, lead and lift charges etc, Complete as per MORTH specifications No. 1500, 1700. (P.No-272 ,I No-37.66 of PWD BCSR 2018-19)	m	272	37.66	1081.00		**1081.00**	64.86	**1145.86**

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KSRB 14.6 : Providing and laying heavy duty cobble stones interlock pavers, 60mm thick using cement and course sand for manufacture of blocks of approved size, shape and colour with a minimum compressive strength of 281 kg per sqm over 50mm thick sand bed (average thickness) and compacting with plate vibrator having 3 tons compaction force thereby forcing part of sand underneath to come up in between joints, final compaction of paver surface joints into its final level, including cost of materials, labour and HOM complete as per specifications. Specification No. KBS (P.No-103,I No-14.7 of PWD BCSR 2018-19), 75mm thick	Sqm	103	14.70	1110.00		**1110.00**
Providing and fixing pre cast solid cement concrete kerb stones made out of CC 1:2:4 with top and bottom width 114 and 165 mm respectively, 400mm high and 450mm in length finished with CM 1:3 plastering and finishing cutting including formwork, curing, including cost of materials, labour charges of machinery, loading and unloading, lead and lift, transportation ete.,complete.(I No-5.30,P No-27 of PWD BCSR 2018-19)	Nos	27	5.30	408.00		**408.00**
KSRRB 800-1. Painting two coats after filling the surface with synthetic enamel paint in approved shades on new plastered concrete surfaces, with materials, labour complete as per specifications.(I No-24.1,P No-180 of PWD BCSR 2018-19)	Sqm	180	24.1	80.00		**80.00**
Construction of granular sub-base Grading-V as Sub-base and drainage layer by providing coarse graded crushed stone aggregates of granite/trap/basalt material, mixing by mix in place method by rotavator at OMC,spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the 98 % proctor density, complete as per specifications. Clause 401 of MORTH V Revision.(I No-20.6,P No-153 of PWD BCSR 2018-19)	Cum	153	20.6	1750.00		**1750.00**

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KSRRB M 500-6, Providing and applying primer coat with SS bitumen emulsion on prepared surface of granular Base such as WBM WMM including clearing of road surface and spraying primer at the rate of 0.60 kglsqm using mechanical means complete as per specifications. As per MORTH specification clause No. 502 (P.No.158, I.No.21.6 of PWD BCSR 2018-19) issue rate Dated 01-01-2019	Sqm	158	21.6	28.00		**28.00**	1.68	**29.68**
KSRRB 500-2. Cleaning the existing black topped surface with brooms, soft brushes and finally dusting with old gunny bags and / or compressed air to receive bituminous treatment including cost of all materials, labour, HOM complete as per specifications. (P.No-158,I No-21.2 of PWD BCSR 2018-19)	Sqm	158	21.2	5.00		**5.00**	0.30	**5.30**
KSRRB 500-7. Providing and applying tack coat using 80/100 grade bitumen(VG10) on the prepared black topped surfaces at 2.5 kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM complete as per specifications (P.No-158,I No-21.7 of PWD BCSR 2018-19) issue rate Dated 01-01-2019	Sqm	158	21.7	12.00		**12.00**	0.72	**12.72**

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19	KSRRB M500-17. Providing and laying dense graded bituminous macadam using crushed aggregates of specified grading, premixed with VG30 grade bituminous binder and, transporting the hot mix to work site, laying to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications Clause 505 of MORTH V revisionusing 40/60 TPH capacity H.M.P. with Mechanical paver Gr-II (50 mm to 75 mm) with 4.5 % VG-30 Bitumen (P.No-160,I No-21.17.6 of PWD BCSR 2018-19) issue rate Dated 01-01-2019	Cum	160	21.17.6	6470.00		6470.00
20	Providing and laying bituminous concrete 40mm thick with hot mix plant, using crushed aggregates of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site, laying with a paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications. Clause 507 of MORTH V revision as per IRC SP-53-2015. using – do – using 40-60 TPH capacity HMP with mechanical paver grading II (30-45mm) with 5.4 % of modified bituminus binder consisting of 4.97% of VG-30 bitumen (60/70 grade) and 0.43% of plastomeric thermoplastics (waste plastic) (P.No.171, I.No.21.78.12 of PWD BCSR 2018-19) issue rate Dated 01-01-2019	Cum	171	21.78.12	7594.00		7594.00
21	KSRRB M800-13.Road Marking with Hot Applied Thermoplastic Compound with Reflectrising Glass Beads on Bituminous Surface/ Concrete Surface: Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads at 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 standards specified. The finished surface to be level, uniform and free from streaks and holes complete as per specifications. MORTH Specification No. 803(P.No-182,I No-24.15 of PWD BCSR 2018-19)	Sqm	182	24.15	429.00		429.00

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22	KSRRB M800-35. *Supply and Installtion of Moulded Shank Raised Pavement Markers made of polycarbonate and ABS(Acrylonitrile Butadiene Styrene)* moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 16000 kg tested in accordance to Specifications of Category A of MORTH Circular No RW/ NH/33023/10-97 – DO III Dt 11.06. 1997. The height, width and length shall not exceed 50 mm, 100 mm and 102 mm and with minimum reflective area of 13 Sqcm on each side and the slope to the base shall be 35 degree. The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 mm and height not less than 30 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturer's recommendation and complete as directed by the engineer (P No-187, I No-24.41 of PWD BCSR 2018-19)	Nos	187	24.41	337.00		**337.00**	20.22

Assistant Engineer
RI,Yelahanka Division
BBMP Bangalore

Asst. Executive Engineer,
RI,Yelahanka Division
BBMP Bangalore

Executive Engineer,
RI,Yelahanka Division
BBMP Bangalore

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Bruhat Bangalore Mahanagara Palike

Excecutive Engineer Road Infrastructure Yelahanka Division

e of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura

Draft Tender Schedule

Description of Item	Unit	Quantity	Rate, Rs	
			In Figures	In Words
Removing and refixing stone slabs of drains and pointing in CM (1:3) including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Sqm	288.00	111.30	Rupees One Hundred Eleven And Paise Thirty Only
KSRRB 300-1. Earthwork excavation by manual means for roads, drains & similar works in ordinary soil excavated surface levelled and sides neatly dressed, the disposed earth to be levelled neatly after breaking of clods complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Cum	430.90	214.50	Rupees Two Hundred Fourteen And Paise Fifty Only
KSRRB M300-14. Excavation for roadwork in all types of soil by mechanical means including cutting and loading to tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transportation with a lead of 6.00 km and complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Cum	2443.38	57.03	Rupees Fifty Seven And Paise Three Only
KSRRB M2100-10. Providing and laying Plain cement concrete of mix 1:3:6 with OPC @ 220kgs, with crushed 40mm and down size graded granite metal coarse aggregates @0.89cum and fine aggregates @ 0.46cum, in foundation mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days including cost of all materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Cum	36.85	5421.90	Rupees Five Thousand Four Hundred Twenty One And Paise Ninety Only
Providing and laying plain/reinforced cement concrete for side drains using M20 nominal mix concrete with OPC at 300 kgs. with 20mm and down size granite metal coarse aggregates at 0.69 cum and fine aggregates at 0.43 cum machine mixed, well compacted for walls and bottom including centering, shuttering, cost of materials, HOM of machinery, curing etc., complete excluding cost of steel as per MORTH specification No. 1500, 1700, 2200. including cost of materials, labour, HOM complete as per specificationsdo- Wall & bottom thickness 10cm including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Cum	78.78	7273.72	Rupees Seven Thousand Two Hundred Seventy Three And Paise Seventy Two Only
KSRB 4.9.2 : Providing T.M.T steel reinforcement for R.C.C work including straightening, cutting, bending, hooking, placing in position, lapping and / or welding wherever required, tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) cost of materials, labour, HOM complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Tn	3.94	72326.98	Rupees Seventy Two Thousand Three Hundred Twenty Six And Paise Ninety Eight Only

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Description of Item	Unit	Quantity	Rate, Rs	
			In Figures	In Words
Providing and constructing granite / trap / basalt size stone masonry in foundation with cement mortar & stone hammerd dressed in courses not less than 20 cms high, bond stones at 2m. apart in each course including cost of materials, labour, HOM, curing complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Cum	50.40	4871.76	Rupees Four Thousand Eight Hundred Seventy One And Paise Seventy Six Only
Providing and laying in position plain cement concrete of mix 1:2:4 with cement @ 240kgs, with 20mm and down size graded granite metal coarse aggregates @ 0.69 cum and fine aggregtes @ 0.459cum, machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, for coping. Including cost of all materials, labour, HOM, curing complete as per specifications. Including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Cum	25.20	5599.98	Rupees Five Thousand Five Hundred Ninety Nine And Paise Ninety Eight Only
Providing and fixing RCC Precast cover slab of 250mm thick for drain in cement concrete M20 using graded granite jelly 20mm and down size with steel reinforcement, including form work, lift charges, curing and concrete finished surfaces on both sides etc, complete and as per drawing and the directions of Engineer in-charge including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Sqm	33.00	3640.00	Rupees Three Thousand Six Hundred Forty Only
Providing and laying 100mm thick pre-cast cover slabs over drains of width not exceeding 800 mm using M20 concrete reinforced with steel @ 6.00 kg/Sqm, slabs jointed in CM 1:3 proportion and nicely finished including providing holes in the Cover slabs wherever necessary for easy drainage of surface water including of labour, materials, HOM of machineries, curing, lead and lift charges etc, including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	m	938.00	1145.86	Rupees One Thousand One Hundred Forty Five And Paise Eighty Six Only
KSRB 14.6 : Providing and laying heavy duty cobble stones interlock pavers, 60mm thick using cement and course sand for manufacture of blocks of approved size, shape and colour with a minimum compressive strength of 281 kg per sqm over 50mm thick sand bed (average thickness) and compacting with plate vibrator having 3 tons compaction force thereby forcing part of sand underneath to come up in between joints, final compaction of paver surface joints into its final level, including cost of materials, labour and HOM complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Sqm	3105.00	1176.60	Rupees One Thousand One Hundred Seventy Six And Paise Sixty Only
Providing and fixing pre cast solid cement concrete kerb stones made out of CC 1:2:4 with top and bottom width 114 and 165 mm respectively, 400mm high and 450mm in length finished with CM 1:3 plastering and finishing cutting including formwork, curing, including cost of materials, labour charges of machinery, loading and unloading, lead and lift, transportation ete.,complete including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Nos	2220.00	432.48	Rupees Four Hundred Thirty Two And Paise Forty Eight Only
KSRRB 800-1. Painting two coats after filling the surface with synthetic enamel paint in approved shades on new plastered concrete surfaces, with materials, labour complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in	Sqm	333.00	84.80	Rupees Eighty Four And Paise Eighty Only

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ption of item
onstruction of granular sub-base Grading-V as Sub-base and rainage layer by providing coarse graded crushed stone aggregates f granite/trap/basalt material, mixing by mix in place method by otavator at OMC,spreading in uniform layers with motor grader on repared surface and compacting with vibratory power roller to chieve the 98 % proctor density, complete as per specifications ncluding all lead and lead including loading and unloading and pecifications as per the direction of engineer in charge
KSRRB M400-17. Providing, laying, spreading and compacting ushed stone aggregates of granite / trap / basalt to wet mix macadam specifications including pre mixing the material with water at OMC in mechanical mix plant carriage of mixed materials by tipper o site, laying in uniform layers with paver in sub-base/base course on well prepared surface and compacting with vibratory roller to achieve the desired density complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge
KSRRB M 500-6, Providing and applying primer coat with SS bitumen emulsion on prepared surface of granular Base such as WBM WMM including clearing of road surface and spraying primer at the rate of 0.60 kglsqm using mechanical means complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge
KSRRB 500-2. Cleaning the existing black topped surface with brooms, soft brushes and finally dusting with old gunny bags and / or compressed air to receive bituminous treatment including cost of all materials, labour, HOM complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge
KSRRB 500-7. Providing and applying tack coat using 80/100 grade bitumen(VG10) on the prepared black topped surfaces at 2.5 kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM complete as per specifications including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge

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KSRRB M800-35. Supply and Installtion of Moulded Shank Raised Pavement Markers made of polycarbonate and ABS(Acrylonitrile Butadiene Styrene) moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 16000 kg tested in accordance to Specifications of Category A of MORTH Circular No RW/ NH/33023/10-97 – DO III Dt 11.06. 1997. The height, width and length shall not exceed 50 mm, 100 mm and 102 mm and with minimum reflective area of 13 Sqcm on each side and the slope to the base shall be 35 degree. The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 mm and height not less than 30 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturer's recommendation and complete as directed by the engineer including all lead and lead including loading and unloading and specifications as per the direction of engineer in charge	Nos	240.00	357.22	Rupees Three Hundred Fifty Seven And Paise Twenty Two Only

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Chapter – 6
EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

The Project area is falls under Yelahanka Division, Byatarayanapura Assembly Constituency in Bangalore City. The Project area is located thickly populated Residential cum Commercial area. The Project Stretch includes connecting roads and cross roads. The spurt in the development of Bangalore City with creation of ITPL, Tech Parks, Layouts, and Education Institutions has resulted in change of the Land Use Pattern. Further, Bruhat Bangalore Mahanagara Palike has decided to take up the development of various Sub arterial, Collector and local streets where the intensity of traffic has increased significantly and there is a requirement for augmentation of capacity for safe and efficient movement of traffic. For the habitation resided in this area it was very difficult to commute on this stretch in the Rainy season due to non proper flow of water on the Roads and lack of proper drainage facility. By considering these reasons the roads are taken up for Development with Asphalting depending upon the site scenario. This being the Background, Bruhath Bangalore Mahanagara Palike has proposed for the following works in order to provide Seamless Traffic Flow and to Increase Level of Service along the Project Stretch.

For the proposed Improvement Scheme, total Cost of the Project has been worked out as Rs. 200.00 Lakh.

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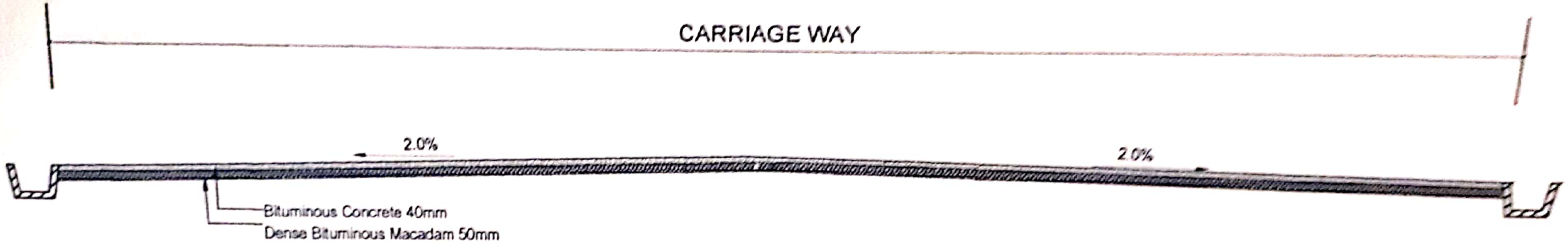
DRAWINGS



Proposed typical Cross section of Asphalt Road Overlay - Main road

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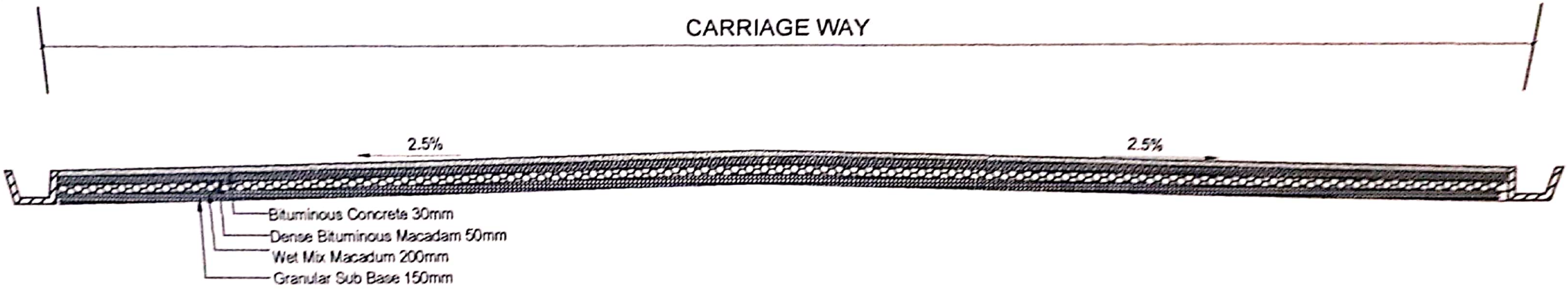

Proposed typical Cross section of Asphalt Road - Ward Road

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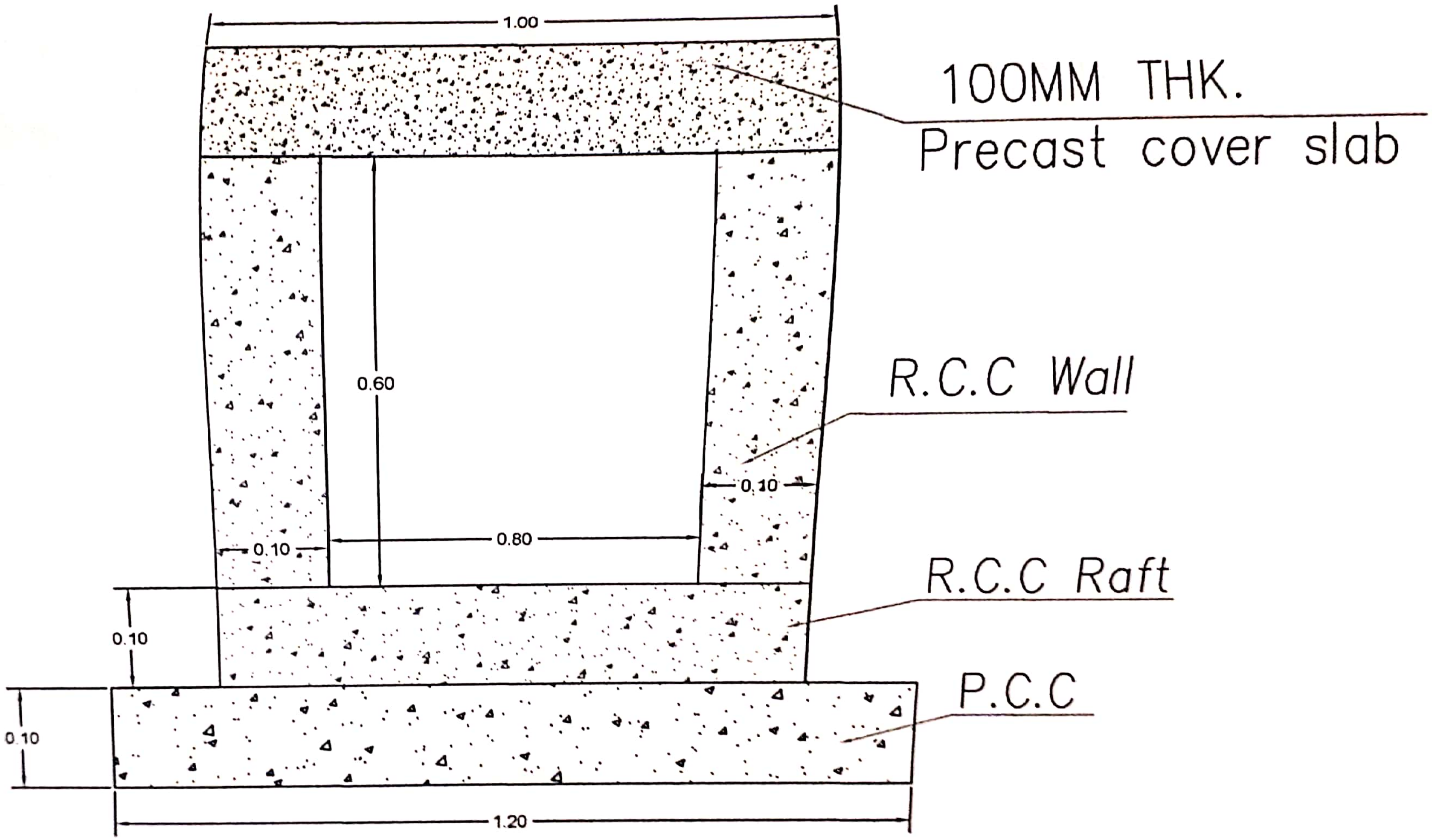

TYPICAL CROSS SECTION OF DRAIN

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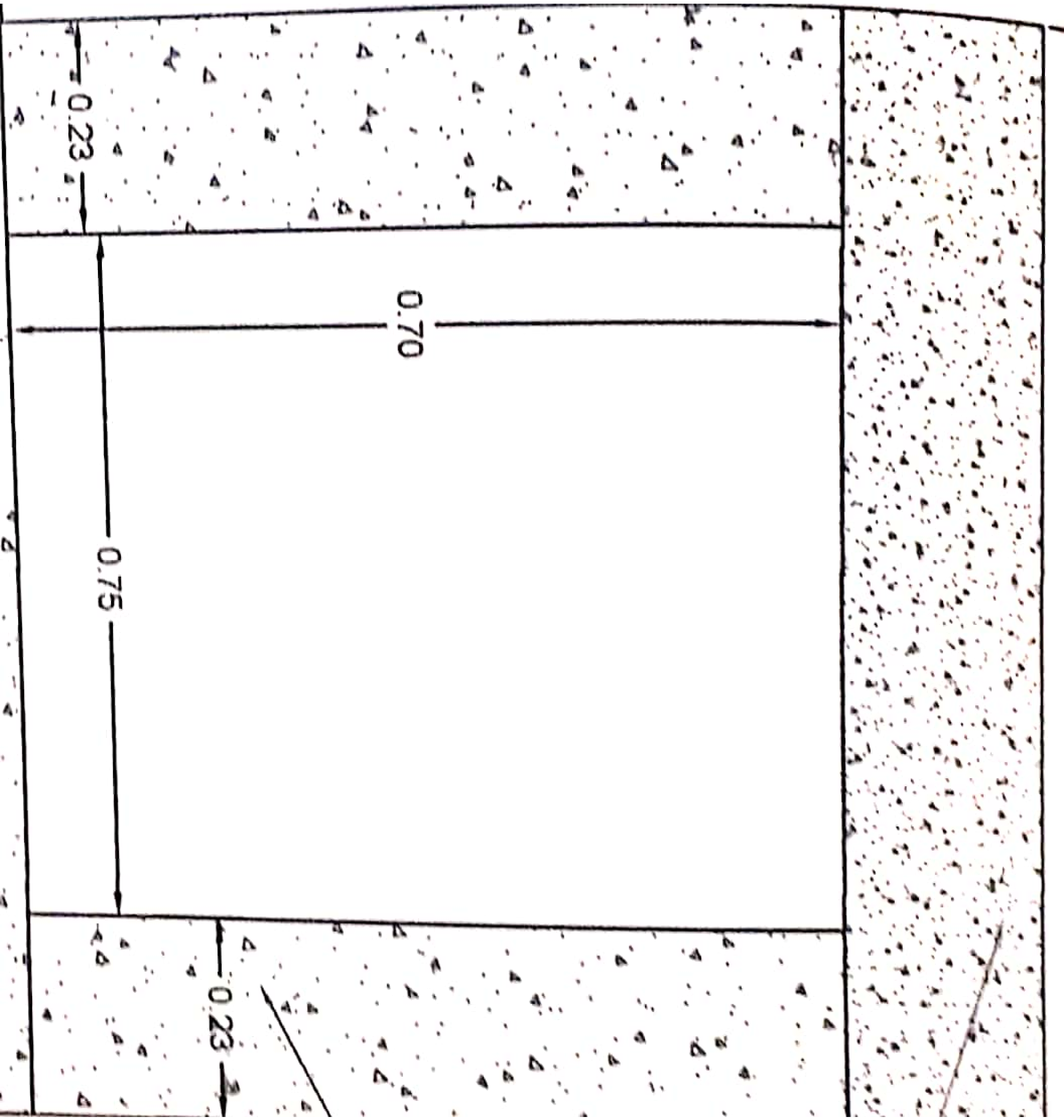

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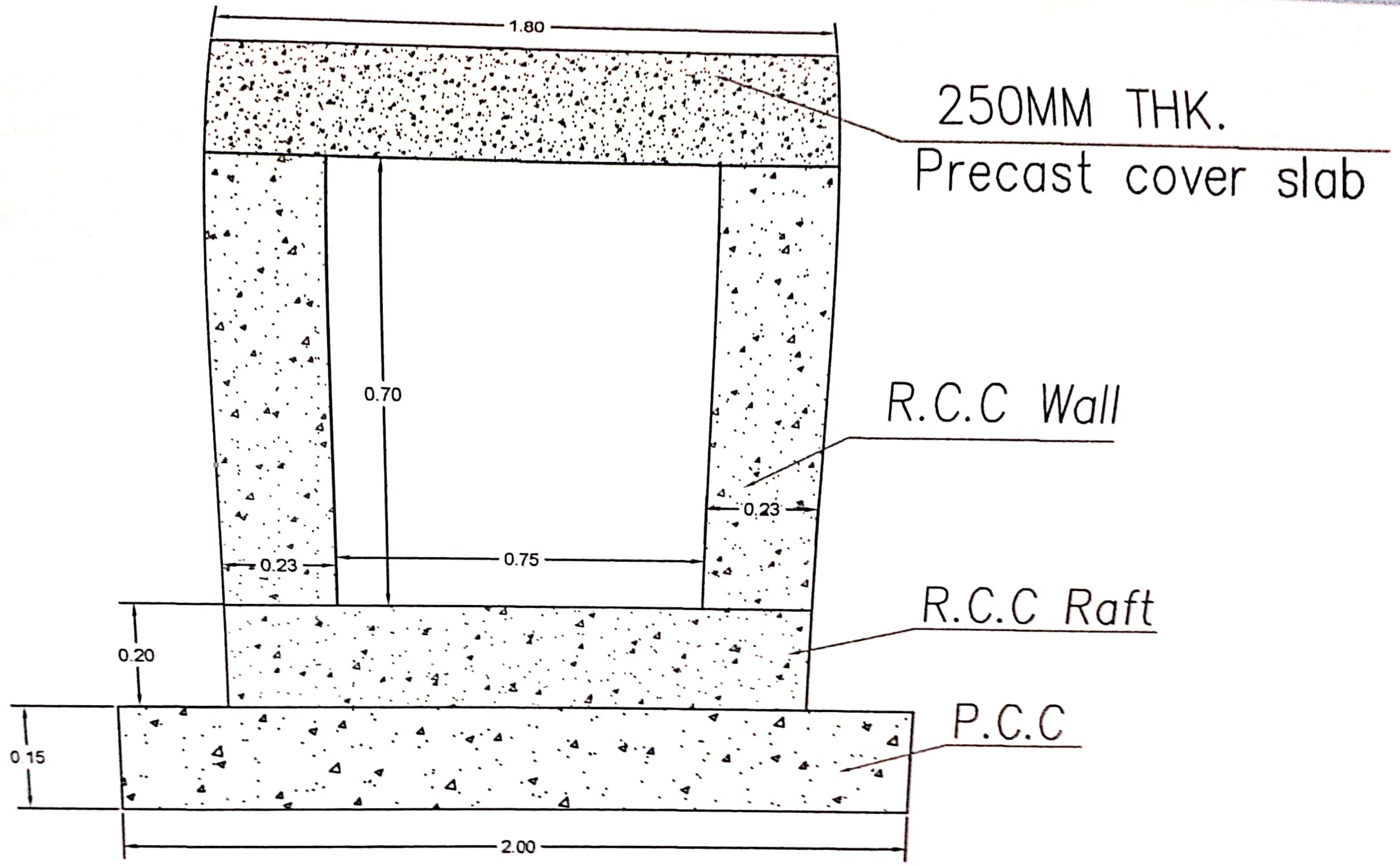

TYPICAL CROSS SECTION OF CULVERT- MAIN ROAD

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PHOTOS

Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura

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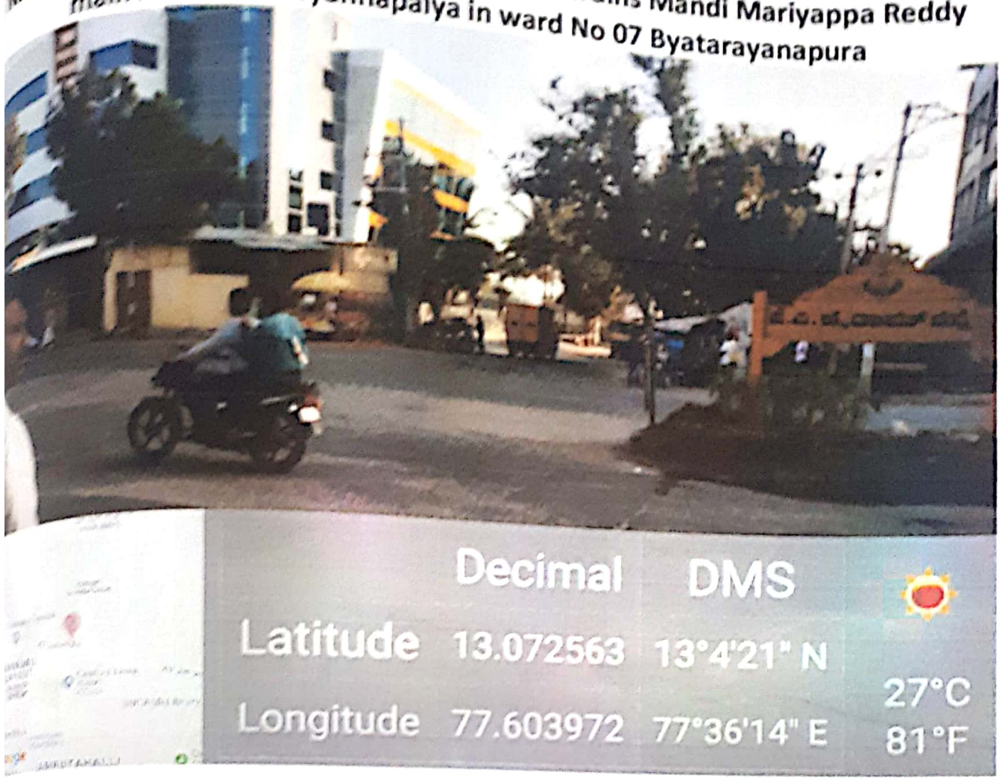
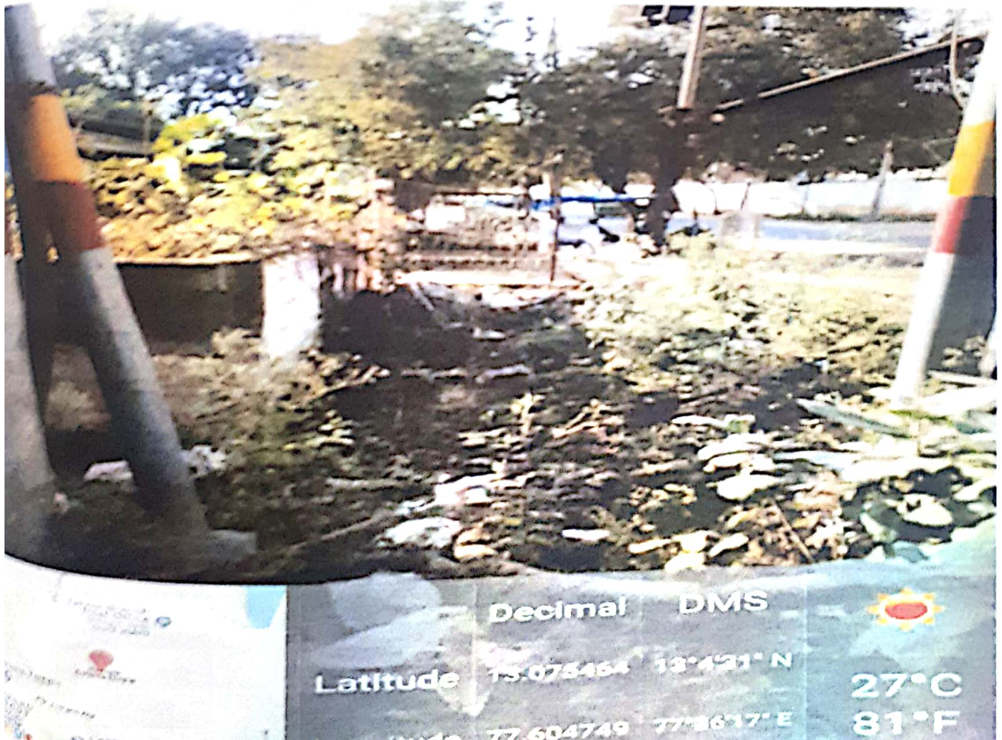
Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura





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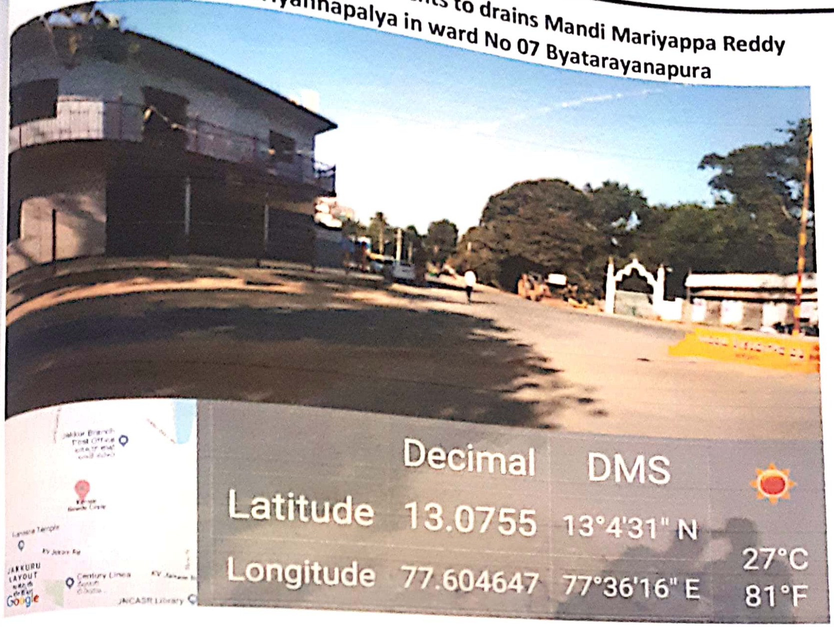
Name of Work: Repair and Improvements to drains Mandi Mariyappa Reddy main road in Mariyannapalya in ward No 07 Byatarayanapura



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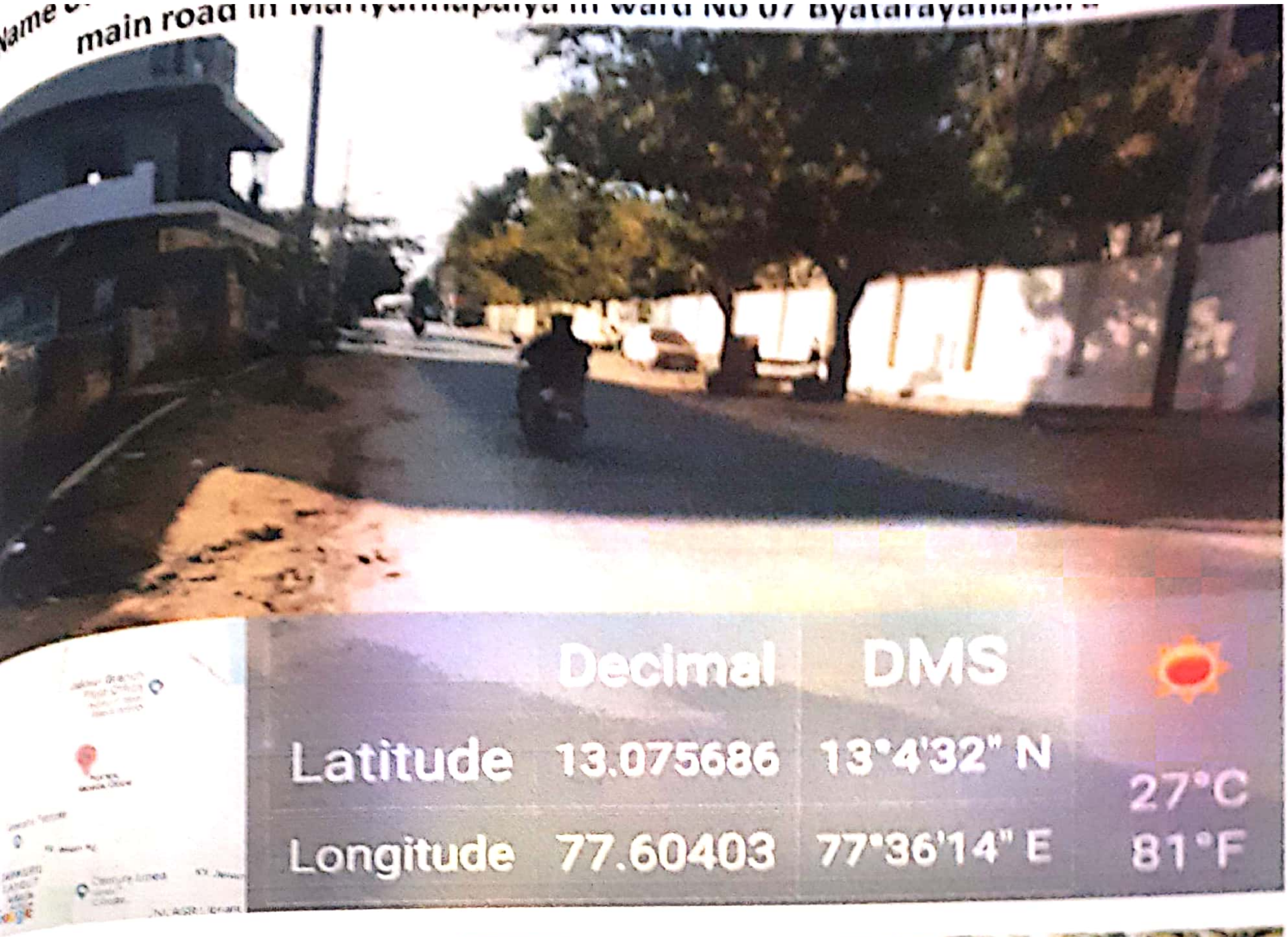
Name o... main road in Mariyannapalya in Ward No 07 Byatarayanapura



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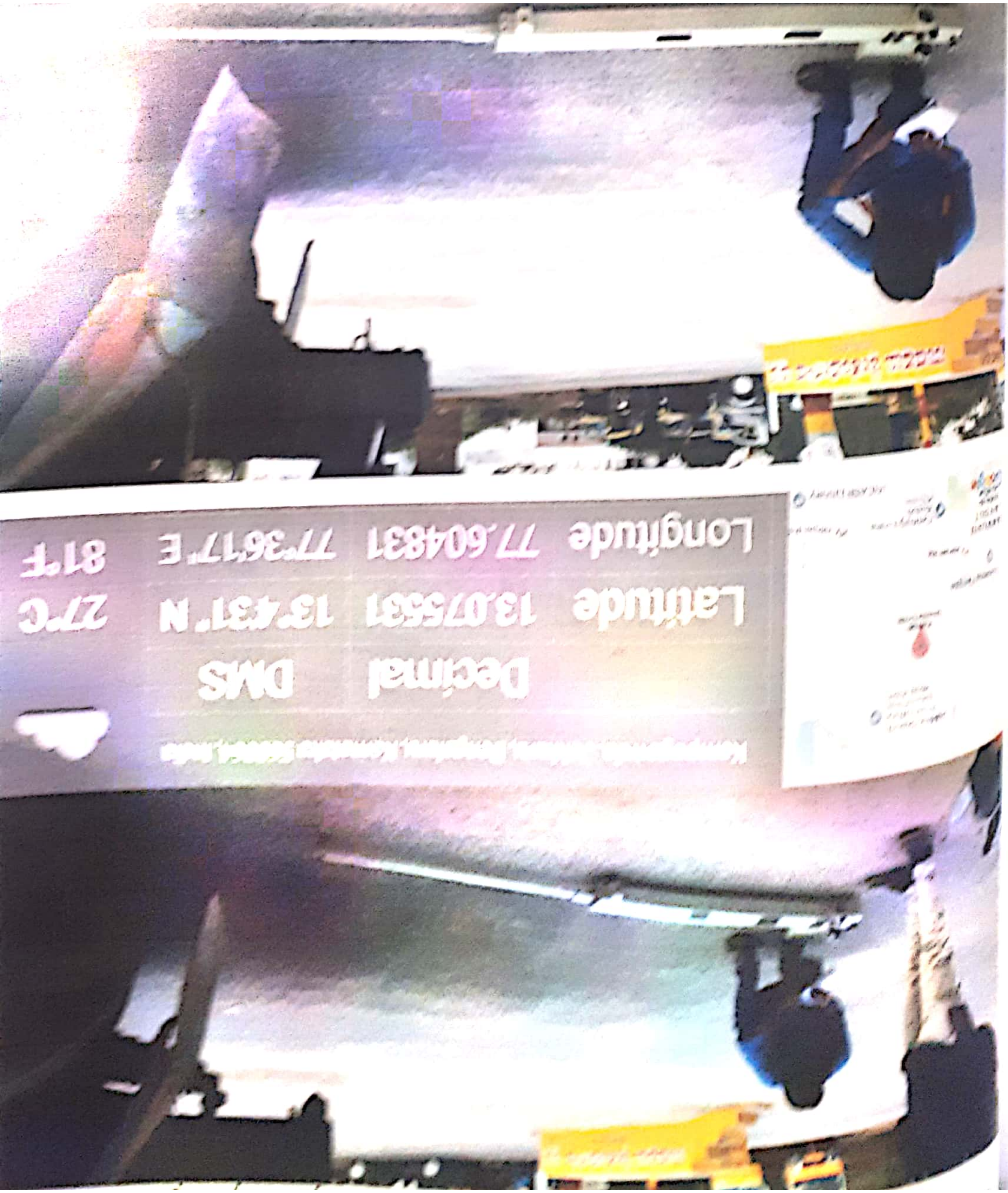

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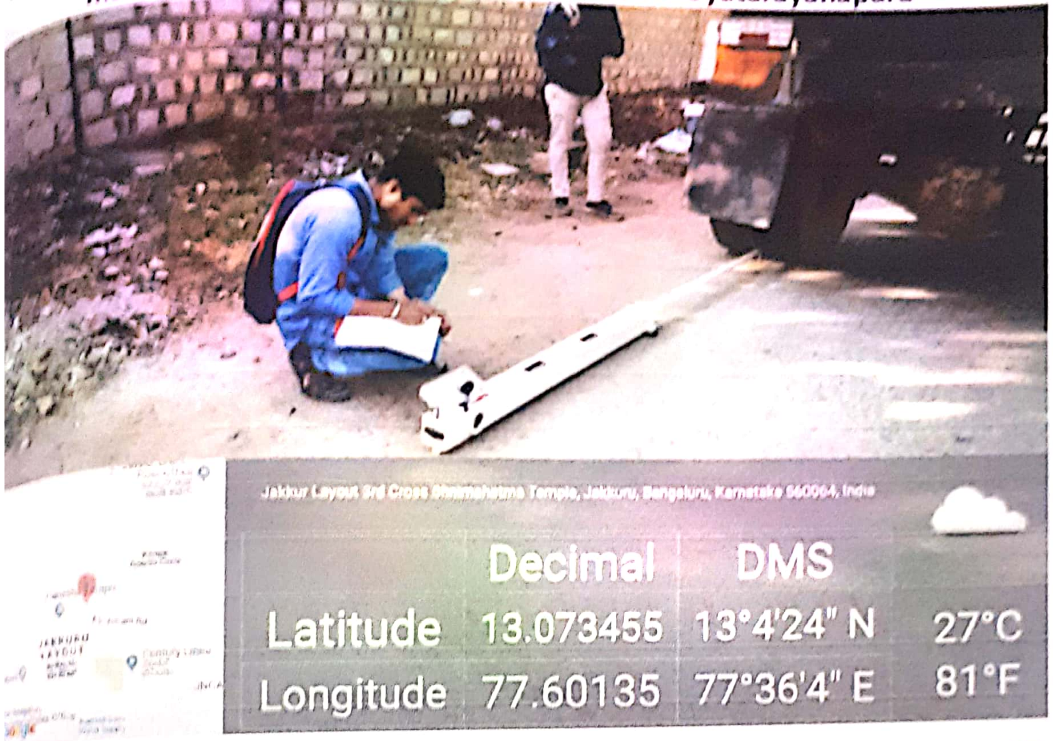

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